THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1375.] LONDON, SEPTEMBER 17, 1889. [41ST YEAR. Price 6d.

WOLSTON'S Paste and Ready Mixed for Use.

Warranted Free from Adulteration. **TORBAY PAINTS.**

FOR GASHOLDERS, &c., &c.

The Original "Torbay Paints"

As supplied during many years to the LONDON GASLIGHT & COKE COMPANY.

TORBAY & DART PAINT Co., Ld.,

23, Gt. George St., Westminster, S.W.

DARTMOUTH, & BRIXHAM (TORBAY).

— ESTABLISHED 1830. —

PARKER & LESTER,

Manufacturers & Contractors.

THE ONLY MAKERS OF

PATENT ANTIMONY PAINT,

Parker's Imperial Black Varnish,

Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:

ORMSIDE STREET, OLD KENT ROAD, LONDON.

Ashmore, Benson, Pease, & Co., Ld.,

STOCKTON-ON-TEES,

Manufacturing Gas Engineers.

See Advertisement, p. 571.

CEMENT

EARLE'S

BEST

PORTLAND CEMENT

MANUFACTURED BY

GEO. & THOS. EARLE,

HULL.

PROMPT DESPATCH:

Seven Jetties on the River.

Two Private Railway Sidings.

FACILITIES FOR DESPATCH:

Six Railway-Waggon Entrances with Steam and Hydraulic Cranes.

Four Rully Entrances.

Three different Railway Companies within easy cartage distance.

Storage Capacity 8000 tons.

Office: 7, PIER STREET.

Works: WILMINGTON.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.

"Abyssinian" Tube Wells.

Pure Water Supplies

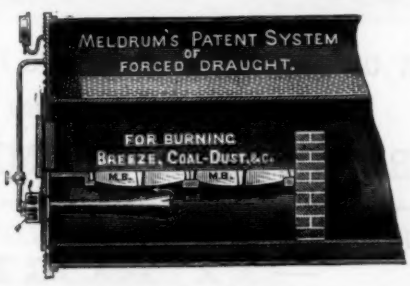
LE GRAND & SUTCLIFF, 100, BUNHILL ROW, LONDON.

Cool Bars.

Easy Clinkering.

Independent of Chimney Draught.

Without moving parts.



Requires no extra Space.

Cannot get out of order.

Moderate Cost.

Results Guaranteed.

BREEZE FURNACES

FOR STEAM RAISING AND RETORT FIRING.

By adopting this System, Gas-Works practically save the whole cost of Fuel.

Knowing the value of these Furnaces, **MELDRUM BROTHERS** are prepared to fit them up, **ON APPROVAL,** to Lancashire, Cornish, Egg-ended, or other Type of Steam-Boiler; also to Retort-Furnaces. Terms on application.

MELDRUM BROTHERS,

26, HALF STREET, CATHEDRAL YARD, MANCHESTER.

TELEGRAMS: "MELDRUM MANCHESTER."

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS,

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.,

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

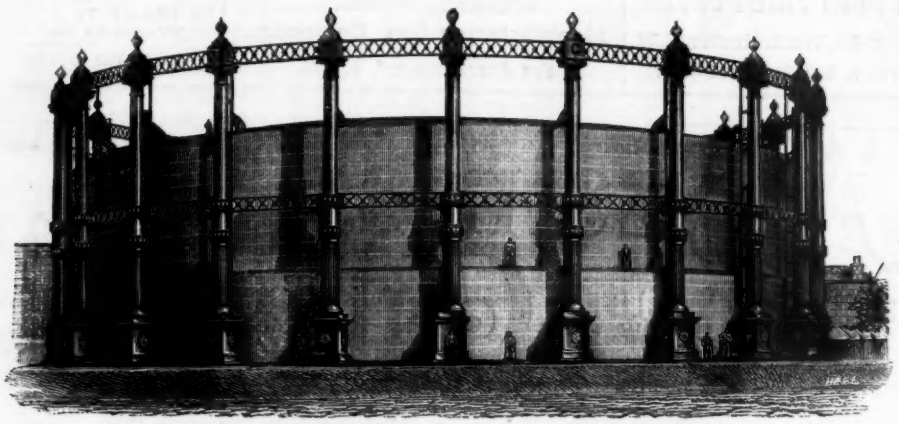
TELEGRAPHIC ADDRESS: "COCKEYS FROME."

EDWARD COCKEY & SONS, Ld.,

ESTABLISHED OVER HALF A CENTURY.

Gas Engineers, Ironfounders, & Contractors,

Manufacturers of GASHOLDERS and TANKS, BOILERS and ENGINES, ROOFS, EXHAUSTERS, BREEZE SCREENS, CHARGING and COKE BARROWS, PATENT WASHERS, PATENT VALVES for PURIFIERS, &c., GOVERNORS, LAMP COLUMNS, WEIGHBRIDGES, COKE-BREAKERS.



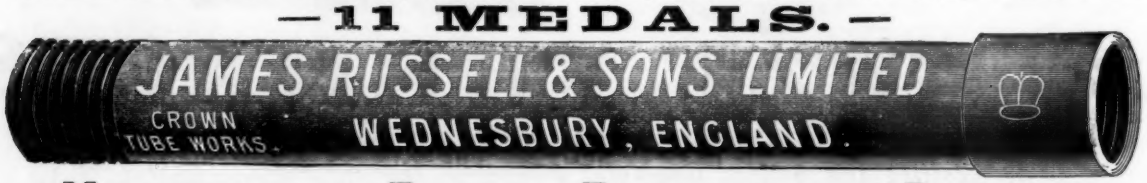
SOLE MAKERS OF COCKEY AND SMITH'S PATENT SELF-ACTING BYE-PASS VALVES.

Estimates for any description of Gas Plant on application.

THE IRON-WORKS, FROME SELWOOD, SOMERSET.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

— 11 MEDALS. —



MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

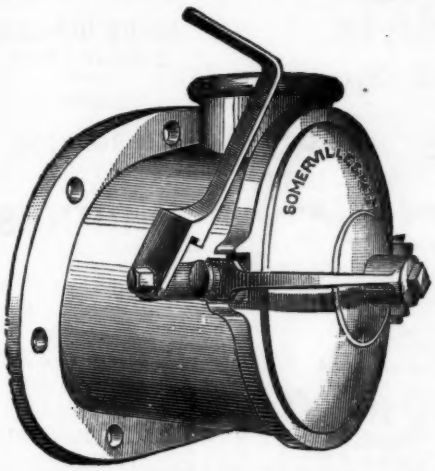
LONDON: 108, Southwark Street. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO.,

(ESTABLISHED 1822)

SPRING HILL, BIRMINGHAM,

MANUFACTURERS OF



GASHOLDERS AND GAS APPARATUS,

INCLUDING

RETORTS AND FITTINGS, PURIFIERS, VALVES, PIPING SCRUBBERS, CONDENSERS, WASHERS, &c., &c., &c.;

GASHOLDER TANKS IN CAST AND WROUGHT IRON;

GOLIATH, HYDRAULIC, AND OTHER PURIFIER COVER LIFTS,

ALL OF THE MOST APPROVED DESIGNS.

BOILERS, ENGINES, PUMPS, EXHAUSTERS, METERS, GOVERNORS, &c.

SULPHATE OF AMMONIA PLANT.

MAKERS OF

SOMERVILLE'S PATENT RETORT MOUTHPIECES & LIDS,

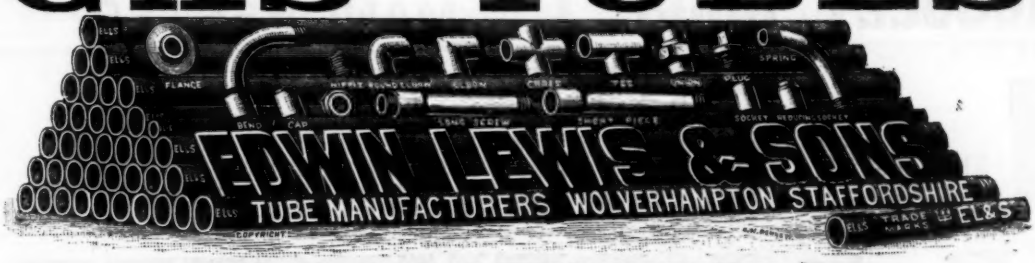
WHICH ARE SELF-SEALING AND REQUIRE NO LUTING.

Prices and further Particulars may be obtained on application.

London Offices: 14, GREAT ST. THOMAS APOSTLE, E.C.—J. E. & S. SPENCER, Agents.

ESTABLISHED 1825.

GAS TUBES



MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

NEWTON, CHAMBERS, & CO., LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

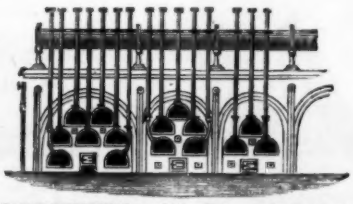
SLIDE VALVES,
With Rack & Pinion, or Internal or External SCREWS, of all Sizes.

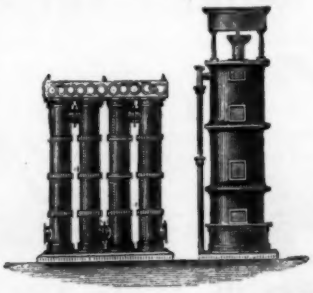
GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS,
RETORT-BED FITTINGS, AND RETORT-HOUSE APPLIANCES of every description.
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.

WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS
TAR AND LIQUOR PUMPS, &c.

PATENT CENTRE VALVES
for working Purifiers. Also Bye-Pass & Stop Valves.



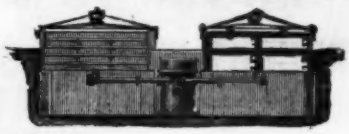


PURIFIERS with Planed Joints.

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS.

WOOD GRIDS.

CAST AND WROUGHT IRON TANKS AND CISTERNS.



DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINE.

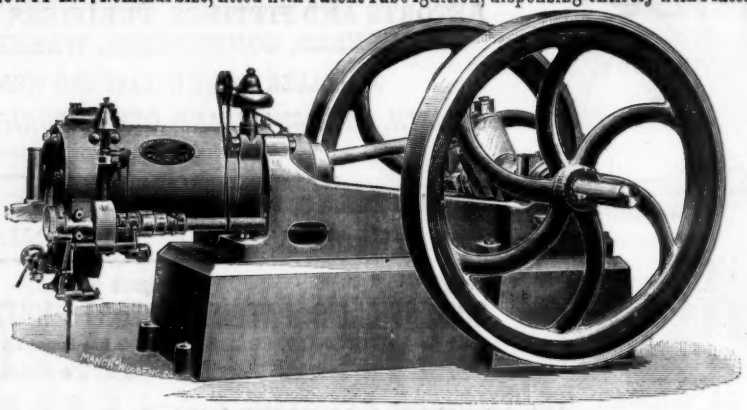
100 Prize Medals.

MADE in SIZES *2-Man to 100-HP.*

GAS-ENGINES COMBINED WITH **PUMPS** FOR TOWNS SUPPLY, SEWAGE, &c., &c.

GAS-ENGINES COMBINED WITH **AIR COMPRESSORS** FOR THE SHONE SEWAGE SYSTEM, LUCIGEN LIGHT, &c.

New 14-H.P. Nominal Size, fitted with Patent Tube Ignition, dispensing entirely with Plates.



MADE in SIZES *2-Man to 100-HP.*

VERTICAL AND HORIZONTAL TYPES.

ENGINES *COMBINED* WITH HOISTS, PUMPS DYNAMOS, &c. &c.

Largely used for EXHAUSTING, PUMPING, COKE CRUSHING, ELECTRIC LIGHTING, &c., &c.

Over **31,000** "OTTO" ENGINES are at work.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER,

LONDON, LIVERPOOL, GLASGOW, NEWCASTLE, BIRMINGHAM, HULL.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND.

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

R. & J. DEMPSTER,

Engineers, Ironfounders, and Contractors,

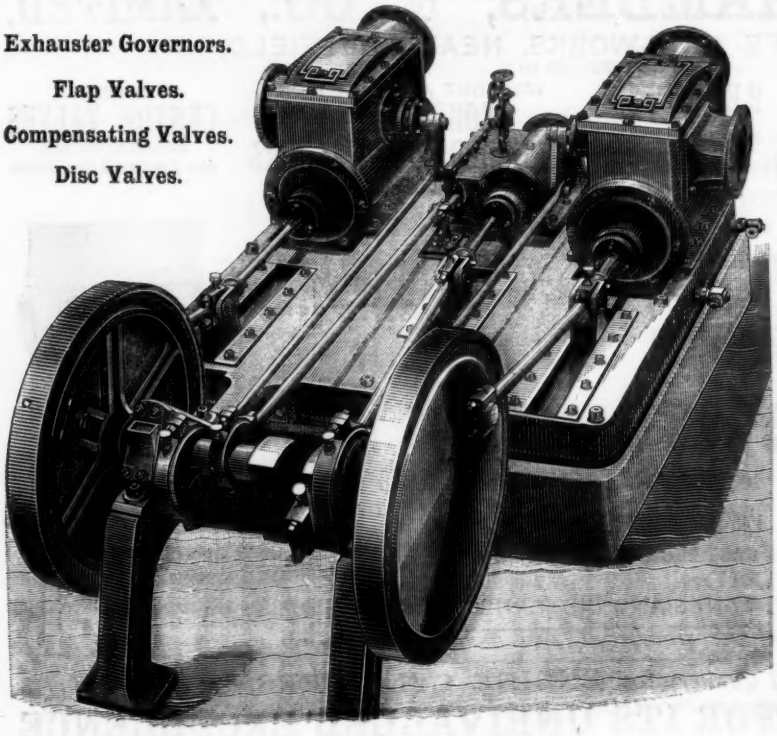
GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

Exhauster Governors.

Flap Valves.

Compensating Valves.

Disc Valves.



GAS EXHAUSTERS.

COMBINED

Steam-Engine and Double-Cylinder

RECIPROCATING

GAS EXHAUSTERS.

These Exhausters work without oscillation, keeping a perfectly steady gauge.

They will force against the highest pressures without slip.

They are substantial in design. The working parts are finished bright, and are provided with large wearing surfaces to ensure durability, and being external, they are easily got at for repairs.

They are very economical in the consumption of steam.

The workmanship and materials are of the highest class.

They are made in all sizes, from 2000 feet per hour upwards.

Three of these Exhausters recently made by us are passing 60 million cubic feet of Gas per day.

KIRKHAM, HULETT, & CHANDLER, Ld.,

PALACE CHAMBERS,

9, BRIDGE ST., WESTMINSTER.

Mr. S. HERSEY, Managing-Director.

THE "NEW" PATENT

"Standard" Washer-Scrubber,

As supplied to and in course of construction for —

The Gaslight and Coke Company, Beckton Station.
" " Pimlico "
The South Metropolitan Gas Company, Vauxhall Station.
Barry and Cadoxton Gas Company.
Hitchin Gas Company.
Melbourne Gas Company.
Workington Corporation.
John Brown and Co., Limited, Atlas Steel Works, Sheffield.

Thoroughly extracts every grain of Ammonia and a large quantity of other Impurities from Gas.

Has been for many months in successful and satisfactory operation at The Gaslight and Coke Company's Station at **BECKTON,**

Resulting in a second order just received to fit up a Washer-Scrubber, of 2½ millions capacity, upon this new principle, at the same station. Other orders for these machines are in course of execution.

A very large amount of patronage has been accorded the "Standard" Washer-Scrubber, of which, up till now, **367** have been supplied, representing a daily make of **318,260,000** cubic feet of gas; but the advantages of the **"New Standard"** will be readily recognized, and its superiority over the present "Standard" may be briefly summarized as follows:—

1. The weight in motion is **only one-seventh** of that in the present machine.
2. It requires **only one-seventh** the power to drive; consequently effecting a large reduction in cost of Engine as well as in steam power.
3. **The Wear and Tear is enormously reduced,** as the Shaft has comparatively little weight to carry.
4. It has been found that the washing surfaces **keep perfectly clean** and free from deposit from end to end of the Machine.
5. It is so constructed that it forms a most powerful, effective, and complete system of purification, gives no pressure, and can be removed and replaced without trouble or injury.
6. The "New Standard," owing to the foregoing, can be supplied at **a large reduction in price.**

Engineers desirous of working Ammoniacal Liquor over and over again prior to leaving the "New Standard" can do so by the automatic and simple arrangement which forms part of this Patent.

The Apparatus can be applied to "Standard" Washer-Scrubbers already in use.

Particulars will be furnished upon application to the above address.

R. LAIDLAW & SON.

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES.

Two Gold Medals, One Silver Medal, One Bronze Medal, and Two Honourable Mentions,

INTERNATIONAL EXHIBITION, EDINBURGH, 1886.

MAKERS IN EDINBURGH OF

STATION METERS, ALL SIZES
GOVERNORS,
PRESSURE REGISTERS
(To Indicate New Time),
PRESSURE GAUGES,
TEST GASHOLDERS
TEST METERS,
SIEMENS' WATER-METER,
ALL KINDS OF GAS APPARATUS & FITTINGS.

MAKERS IN GLASGOW OF

CAST-IRON PIPES, ALL SIZES
LAMP PILLARS,
STEAM-ENGINES,
PUMPING ENGINES FOR WATER-WORKS,
BEALE'S GAS EXHAUSTERS,
WROUGHT-IRON TUBES AND FITTINGS,
BEAMS, COLUMNS, TANKS, &c.

Wet and Dry Meters of every description repaired, altered, and adjusted, at prices which we shall be pleased to furnish on application.

A LARGE STOCK OF METERS ALWAYS READY FOR IMMEDIATE DELIVERY OR SHIPMENT.

Descriptive Price Lists, Estimates, & full particulars forwarded on application.

ALLIANCE FOUNDRY, **GLASGOW.** | SIMON SQUARE WORKS, **EDINBURGH.** | 6, LITTLE BUSH LANE, **LONDON, E.C.**

TANGYES LIMITED

CORNWALL WORKS, BIRMINGHAM.

LONDON: 35, Queen Victoria Street, E.C.
NEWCASTLE: St. Nicholas Buildings.
MANCHESTER: Deansgate.
GLASGOW: Argyle Street.
PARIS: Place de la Republique.
SYDNEY: 119, Bathurst Street.
MELBOURNE: Collins Street West.

SOLE MAKERS OF THE

"SPECIAL" STEAM PUMP

FOR PUMPING

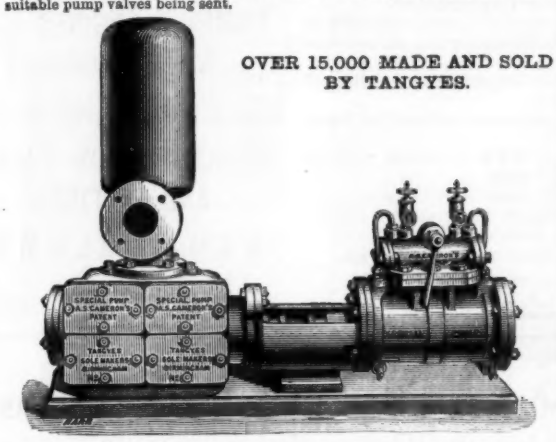
AMMONIACAL LIQUOR, TAR, & WATER IN GAS-WORKS.

Used in the Principal Gas-Works in the United Kingdom.

REDUCED PRICES.

The "Special" Double-Acting Steam-Pump is now made in some 250 sizes, and of many different designs, to suit particular requirements.
In ordering, state the purpose for which the Pump is required, to ensure suitable pump valves being sent.

OVER 15,000 MADE AND SOLD BY TANGYES.



In case of Special Quotations, the following particulars are required:—
Pressure of steam at cylinder.
Number of gallons to be raised in a given time.
The height of lift from level of water to point of delivery.
The nature of the fluid to be pumped.

The "Special" Steam-Pump can be worked by Compressed Air. For pumping Tar or Ammoniacal Liquor, the "Special" Steam-Pump is made with extra long distance piece, for which an additional charge is made.
The quantities of Tar delivered should be taken as about two-thirds those of water given below.

SIZES SUITABLE FOR GAS-WORKS.

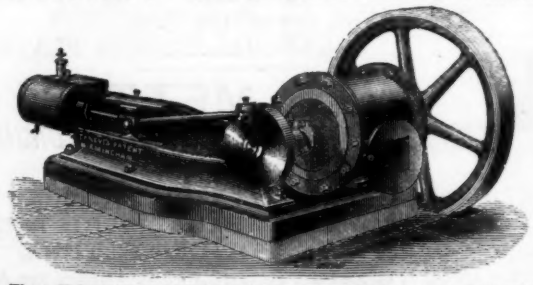
Diam. Steam Cyl. ins.	3	3	4	4	4	5	5	5	5
Diam. Water Cyl. "	1½	2½	2	3	4	2½	3	4	5
Length Stroke . . "	9	9	9	9	9	12	12	12	12
Gals. per hour, approx.	450	1800	800	1800	3200	1250	1800	3200	5000
Diameter Suction and Delivery . . . ins	1	2½	1½	2½	2½	2	2½	3	3½
Price . . . . . £	9	12	11	13	15	15	16	19	22

Diam. Steam Cyl. ins	6	6	6	6	7	7	7	7	7
Diam. Water Cyl. "	3	4	5	6	3	4	5	6	7
Length Stroke . . "	12	12	12	12	12	12	12	12	12
Gals. per hour, approx.	1800	3200	5000	7200	1800	3200	5000	7200	9800
Diameter Suction and Delivery . . . ins.	2½	3	3½	4	2½	3	3½	4	5
Price . . . . . £	17	20	23	26	19	22	25	28	34

Diam. Steam Cyl. ins.	8	8	8	8	8	9	9	9	9
Diam. Water Cyl. "	4	5	6	7	8	5	6	7	8
Length Stroke . . "	12	12	12	12	18	12	12	12	18
Gals. per hour, approx.	3200	5000	7200	9800	12800	5000	7200	9800	12800
Diameter Suction and Delivery . . . ins.	3	3½	4	5	6	3½	4	5	6
Price . . . . . £	24	27	31	36	43	29	34	39	46

Diam. Steam Cyl. ins.	9	10	10	10	0	10	10
Diam. Water Cyl. "	9	5	6	7	8	9	10
Length Stroke . . "	24	12	12	12	18	24	24
Gals. per hour, approx.	16200	5000	7200	9800	12800	16200	20000
Diameter Suction and Delivery . . . ins.	7	3½	4	5	6	7	8
Price . . . . . £	56	32	37	42	50	60	67

TANGYES' IMPROVED ROTARY GAS-EXHAUSTER.



These Exhausters are supplied with or without Engine. The smaller sizes (Nos. 1 to 6), when supplied with Engine, are mounted on strong cast-iron base plate—as illustrated—which also carries the Engine.

No.	Cubic Feet per Hour.	Inlets and Outlets.	Horse power of Engine.	PRICE.
1	2,000	3 inches.	2	£60
2	3,000	4 "	2	65
3	5,000	5 "	2	75
4	7,500	6 "	2	80
5	10,000	7 "	3	95
6	15,000	8 "	3	115
7	20,000	9 "	4	125
8	30,000	10 "	6	175
9	40,000	12 "	8	210
10	50,000	14 "	10	260

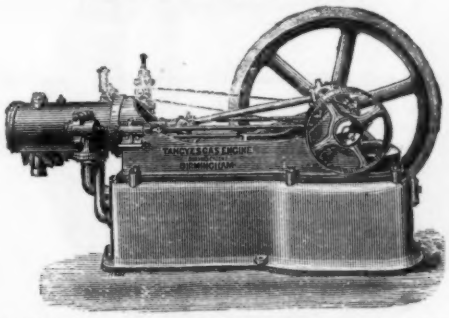
Prices of larger sizes on application.

THE "TANGYE" GAS-ENGINE

(ROBSON'S PATENT)

Royal Cornwall Polytechnic Special Gold Medal, 1882.

(Also for Gas Producer and Feed Pump.)



The ¼, 2½, and 4 horse power sizes are of the type shown in illustration. The 1-horse power size is of the type of the "Tangye" Steam-Engine.

Working size	¼ H.P.	1 H.P.	2½ H.P.	4 H.P.
Test Horse Power	1	1·4	3	6
Revolutions per minute	180	170	170	160
Price, Engine on Base with Tank £	60	82	115	140

Note.—The Test Horse Power in the table above is that given off at the Driving Pulley in actual test with Dynamic Brake at our Works.

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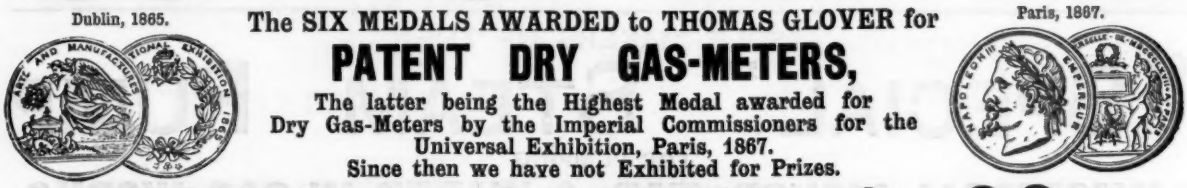
ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris, 1867.



The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

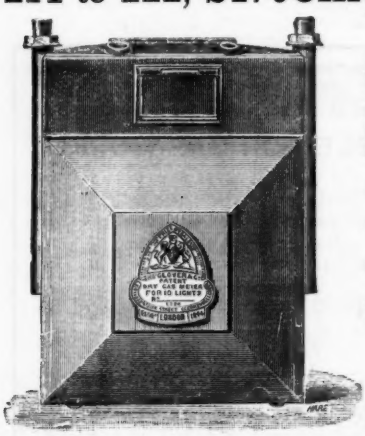
The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.
Since then we have not Exhibited for Prizes.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

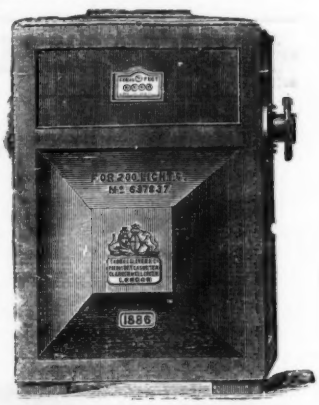
214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

TELEGRAPHIC ADDRESS: "GOTHIC LONDON." TELEPHONE No. 6725.



1st—Are a remedy for all the defects of Wet Meters.
2nd—Are suitable for all climates, whether hot or cold.
3rd—Incur no loss of Gas by Evaporation.
4th—Cannot become fixed by frost, however severe.
5th—Are the most accurate & unvarying measurers of Gas.
6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.
Are upheld for five years without charge.

Meters fitted with Grey's Index or Harding's Counter.



W. PARKINSON & CO.,

MANUFACTURERS OF

DRY METERS

OF THE

VERY BEST QUALITY.

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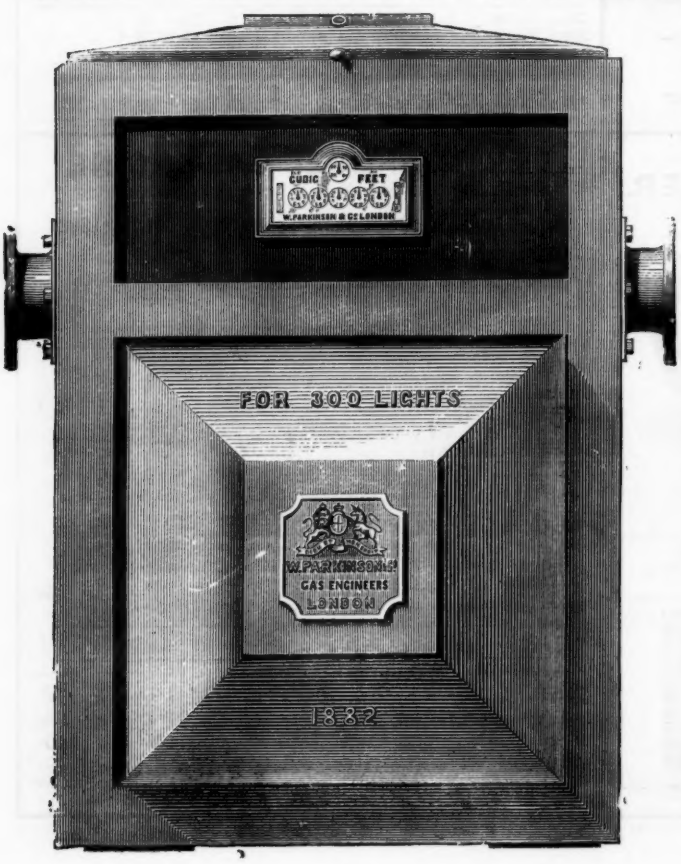

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, SEPTEMBER 17, 1889.

THE LABOUR QUESTION—WHO IS TO RULE?

THE great strike of dock and riverside hands of the Port of London is now over. This was the report which the newspapers circulated on Saturday, when it was announced that the men's demands of an additional penny per hour, with a minimum rate of 2s. for a day's pay, had been conceded by the Dock Companies. The advance had been agreed to in principle for several days previously; but there was a difficulty as to when it was to begin. The men wanted it at the earliest possible moment; and the Companies wished to defer it until the beginning of the new year. Negotiations with a view to the time-honoured form of compromise called "splitting the difference" were carried on, however, by the mediators who had set themselves to settling the dispute; and these resulted in the acceptance of Nov. 4 as the date for the new arrangement coming into force. There are several points remaining for settlement, chiefly among the lightermen and allied orders of labour who came out to assist the dockers; but these are to be referred to arbitration between now and the stated date for the new scale of wages in the docks. The great thing is that a labour movement which has paralyzed the trade of the Port of London for weeks, and cost a scarcely determinable sum in money, to say nothing of infinite personal suffering, has been brought to a close by legitimate means. Of course, an eruption of this kind is not to be passed over lightly. It will leave effects that will show themselves in the commerce and industry of London, and indeed of the world, for a very long time. There are those who go so far as to predict that the trade of the Metropolitan Port will never recover from the paralysis with which it has been stricken; but this is surely an exaggeration. From the history of the strike published by one of the daily newspapers, it appears to have lasted almost exactly a month; the first of the trouble having occurred on the 13th ult., when the men at the South West-India Dock left their employment in consequence of the refusal of the Deputy-Superintendent to grant the terms demanded in a letter delivered to him on the morning of that day. On the following Monday, the strike extended to the other docks on the north side of the river; to be followed by a general suspension of work by nearly all classes of riverside labourers in the course of the same week. The loss inflicted upon the export and import trade of the port while the strike lasted, is reckoned at upwards of two million pounds sterling; and depreciation in dock property from the same cause is valued at another million. The men have lost in wages more than can be estimated; and notwithstanding the efforts of their sympathizers, the sufferings of those dependent upon dock and riverside work for their livelihood have been extreme. On the other hand, the crowds of unemployed men have been very well behaved. If the authorities responsible for the preservation of order in the capital have been made more anxious than usual for their charge, no sign of anything of the kind has been given. There has been no requisition for special constables to assist in keeping the peace; and not a single regiment of soldiers has been drafted into the Metropolitan or Suburban barracks. The significance of this truth appears very conspicuously when one pauses to ask oneself what would very likely have happened if the processions of working men, 40,000 or 50,000 strong, had paraded the streets of Paris or Berlin instead of London. Mr. John Burns and his brother Socialists, who put themselves at the head of the strikers, may not be altogether admirable specimens of civilized Englishmen; but, after all, it would be an insult to name in the same breath with them the Anarchists of the Continent. It is only necessary, moreover, to cite the Pennsylvania Railroad strike of a few years ago to show that the London democracy is law and order personified when compared with that of the United States.

We name these considerations in order to reassure those nervous folks who may have been inclined to fear for the safety of the railways and gas-works of London. At the very height of the strike fever, a mob of unemployed men, seeking to coerce the operatives in a London gas-works into joining their ranks, was turned away by a handful of police. It was not that the men were afraid of the almost weaponless representatives of civil order; but, as a matter of fact, violence and outrage did not enter into the scheme of their movement. That there was a certain amount of intimidation in their programme is only what might be supposed from their whole policy; but their grievance was not of the kind that calls for outrage to relieve it, even to the most darkened mind. It is quite possible that we may live to see the London railways and gas-works guarded by artillery, and the streets cleared by cavalry patrols; but when such a state of things arises, it will be as a result of something very different from the recent demand of dock labourers for an additional penny an hour. Then will be time enough to raise the alarm of cessation of the gas supply; but even then the necessity for keeping the capital lighted will be so paramount that the Companies will be entitled to call on the Admiralty, if the need arise, to protect their coal steamers by convoys of gunboats, and on the Commander-in-Chief to garrison their works with troops.

Another grain of comfort is to be gleaned in the consideration that there is every prospect that the improvemen

of the lot of the casual waterside labourer, which we have mentioned in previous issues as a possible effect of the strike, will be realized. The present system of dock employment is recognized on all hands as radically defective. It grew out of small beginnings; and there is no indication that the managers of the docks, or the descriptive writers who used to make out of the circumstances of employment in the docks such interesting "copy" for the magazines and newspapers, ever realized the social mischief that was being done. The dock foremen were instructed to divide their favours among the crowd of applicants for work, after the permanent hands and the "preference" men were taken on. According to the exigencies of the moment, there might be 5000 or 15,000 of these "casuals" called in, to receive 5d. an hour for just so long as they were employed. It has probably been a surprise to the dock authorities to learn that this system, which has been in vogue for years, is regarded with disfavour not only by the men themselves, but also by the general public. A man might, it is true, go down to the dock gates and obtain employment without being asked any questions; but it was a lottery which disorganized those who fell under the system. Now it is at least possible that matters will be changed. There will be fewer casuals required when it is known that they will have to be paid 6d. per hour, and not less than 2s. for a job. Machinery will be developed as far as possible; and the staff will be constituted, as fully as practicable, of permanent and preference men. Thus the character of the docks, as the sink to which all the refuse labour of the town gravitates, will be materially altered.

Belonging to the same order of ideas as the dock strike, but not exactly connected with it, is the further development of the labour troubles in the London Gas-Works, upon which Mr. George Livesey wrote last week, and which has since been going on towards the inevitable crisis. It would be a mistake to suppose that all difficulty with the stokers and yard hands has ceased with the grant of the eight-hours shift. The Union has come into existence; and its officials are already trying on the same tactics that trades unionists have employed since the days of Broadhead and the Sheffield grinders' combination. They prefer demand after demand, until sooner or later the question arises whether the Union officials or the employers are to manage the works. The exclusion of non-union men from employment has been taken in hand by the Gas Workers' Union, as was stated by Mr. Livesey last week; and the issue of who is to rule may as well be fought out upon this question as on any other. Yet we believe we are correct in stating that the miserable want of accord between the heads of the three London Gas Companies will prevent anything like united action against whatever demands may be made by the leaders of the society. Up to the present time, it is rumoured that The Gaslight and Coke Company have done nothing in response to Mr. Thorne's notice; which means that they accept it, and that henceforth the Company's works will be managed under the paramount rule of the Union. What Mr. H. E. Jones means to do, we know not; but he seems disinclined to take up any line that is not in accord with Mr. Phillips. He has a very ticklish course to steer, however; for his other friend, Mr. Livesey, has decided to fight the Union to the bitter end, if necessary, in order to retain control of the works. There was a great meeting of the managers and workmen of the South Metropolitan Company on Wednesday last, at which the Chairman, as we understand, laid down the principle that the works would in future, as in the past, be managed by the Directors through the Station Engineers and Superintendents; that no notice would be taken of any rules or resolutions of any outside body; and that every workman would be protected in the discharge of his duty to the fullest extent of the law and the Company's means. The Crystal Palace Gas Company naturally follow the South Metropolitan; and they have already struck the first blow by discharging one of the "firebrands" of the Union who had publicly threatened that the Company's works should henceforward be manned by none but Society men. The issue has been raised, and must now be settled in one sense or the other.

There is nothing new or startling in all this. Usurpation of controlling power is one of the points always attended to by a Trades Union that gets to think itself powerful enough. There is not an industry in the country that has not had to cope with the difficulty; and there is no reason why it should not be conquered by the Gas Companies as it has been by printers, engineers, and other employers. In some trades the Union really has claims upon the men, on account of services rendered in the past; but this is not the case with gas workers. It may suit the book of the paid officials to represent the eight-hours shift as gained by their efforts; but everybody knows that it was not really so. There was never any dispute about it as soon as the matter was fairly broached; and, after all, the change in London was only an assimilation to previously existing practice in other places where no Union of gas stokers had ever been heard of. We are not very much concerned, however, in depriving Mr. Thorne and his colleagues of such satisfaction as they may reap from the impression that they did the business all by themselves. The stokers may canonize the General Secretary of their Union if they please; and the *Labour Elector* may indite pæans to his name, so long as the Editor of that organ thinks such a course will gratify his subscribers. We shall not complain of all or any of this; but at the same time we shall maintain that, when gas stokers come to their sober senses, they will see that they have no need of a Trade Union. They do not serve an apprenticeship to their craft, such as it is, but grow into it first as winter hands and then as permanent stokers. When once engaged as a gas-works stoker, an able-bodied man never need fear being thrown out of work for causes beyond his own control. The demand for stokers is a constantly growing one. A stoker is not like an ordinary craftsman, who may have to travel in search of work through the failure of employers, slackness of trade, and the like. His work is certain; and he enjoys such allowances, sick payment, and superannuation, and in some places holidays with full pay, as very few other occupations provide. What can a Union do for him, except meddle with the conditions of his work? The very points which most Trades Unions are framed to deal with, have no existence for the gas stoker. If Unions were calculated to benefit the stoker in any way that his employers cannot effect, we should say by all means let them be formed. As the facts are, however, the Union is unnecessary; and the Union official is an intruder who must be dealt with summarily before the power which he now pretends to assume has become strengthened by acquiescence on the part of those from whose hands he would snatch it.

THE HUNTER COMPACT AGAIN.

Somewhat late in the day, *The Times* has published a *résumé*, by a Manchester correspondent, of the later developments of the Hunter affair in the neighbouring borough. Although decidedly behindhand in point of time, if the vote of the Salford Town Council is to be regarded as practically settling the matter, the publication may be useful in showing the world what manner of people they are who rule Salford. After learning how the Salford magnates have agreed to condone, for a lump payment of £10,000, the offence of the men who bribed Hunter, it may be easier to understand how the affairs of the Salford Gas Committee got into such a thoroughly rotten state. It is a remarkable fact that, as *The Times* correspondent admits, the local public are not violently excited over the action of their representatives. Whatever others may think of their action in staying proceedings for a cash payment, the Salford ratepayers are not at all irritated by the willingness to compromise the matter which is shown by the leading men of the Corporation. Some of the residents in the borough may hold that there was something peculiar about the coincidence of the petition for the mitigation of Hunter's punishment with the acceptance of the £10,000 by the Corporation; and if the Home Secretary had acceded to the request preferred to him under such circumstances, there might have been more said about it. As the petition has been rejected, however, the position of the Corporation is decidedly strengthened. The town will have the money, and Hunter will remain in gaol; and the combination of results will strike the Salford ratepayer as not a bad one for his own interests. The correspondent of *The Times* lays stress upon the curious fact that the Salford Corporation could not get anything tangible out of the firms they were prosecuting in connection with this Hunter business, until the Court of Appeal, reversing the decision of the Court below, ordered that they might inspect the defendants' books. Then the matter came to a head; and the next bit of news to transpire in regard to it was that the Corporation were "squared." On the whole, we think the *Manchester Guardian* hit off the situation best of the daily papers, when it declared that the Corporation had displayed unimaginable ineptitude in permitting themselves to be bought off by the Hunter party. Salford is not what an American would call a "high-toned" place. It is regarded locally as a mistake. All the same, it might have been

thought that £10,000 would scarcely be enough money to buy its character outright. At the moment of writing, we learn that a memorial is being circulated for signature in the district, asking the Government to appoint a Royal Commission to investigate the affairs of the Salford Corporation for the past twenty years; and that a large number of signatures have already been obtained. This may come to anything or nothing; and we shall therefore await the result of further proceedings on the part of the instigators of this revolt against the duly constituted authorities, before attempting to estimate the strength of the movement.

THE BRITISH ASSOCIATION MEETING.

The British Association have met in Newcastle, and the proceedings have been even more devoid than we expected of matters specially interesting to our readers. The President (Professor Flower) was particularly limited in the selection of the matter for his Inaugural Address; and one can well imagine how some of the less severely technical ex-Presidents, like Sir Frederick Bramwell, must have marvelled when they heard him throw away such a splendid opportunity for talking at large. The example thus set was closely followed, and all the Inaugural Addresses of the Presidents of the different Sections were painfully technical. It was all very proper and scientific; but also wofully slow. Where be the brilliant discoverers and eloquent apostles of science whose doings and sayings in bygone British Association meetings were wont to set the world agape for weeks and months at a stretch? Is there nothing more to be found out? one may hear a general newspaper reader asking; or are the right men wanting for the time? Mr. William Anderson, the President of the Mechanical Science Section, devoted the greater part of what is generally a practical address, to more or less vague talk about the molecular structure of matter. He was not above dealing with the concrete, however, for he dropped very suddenly from the discussion of abstruse physical problems into some commonplace remarks upon petroleum. He did this apparently for the purpose, principally, of leading up to a statement which he made in reply to the customary vote of thanks, to the effect that the recent rumours respecting the prospect of a failure of the Russian petroleum supply are untrue. This rumour has been mentioned in the Journal on several occasions; but Professor Mendeleef has written to Mr. Anderson desiring him to contradict it. The great Russian specialist, who ought to know what he is talking about, declares that there is not the slightest falling off in the petroleum supply; and that the statement to this purport which found its way into circulation in the newspapers, was merely a "dodge" of market operators who desired to carry out certain financial speculations.

MR. W. ANDERSON ON GAS AND PETROLEUM.

In the course of his presidential address to the Mechanical Science Section of the British Association, which is noticed in the above paragraph, Mr. W. Anderson, M. Inst. C.E., went rather out of his way to praise petroleum as an illuminant. He said that even in this country petroleum is to a large extent superseding all other illuminants in private houses, and also in public lamps, "because it gives a cheaper and "more brilliant light than ordinary gas, and leaves the consumer free from the tyranny of great and privileged Com-"panies." Now, one does not like to accuse a Sectional President of the British Association of talking downright rubbish; but it is difficult to say anything else by way of characterizing Mr. Anderson's remarks upon this subject of the competition between gas and petroleum for lighting. We have nothing to allege against the petroleum lamp for indoor use, where people cannot get good and cheap gas. It has brightened many an interior that would have been dark and dismal without it; and in many a dingy, tortuous alley of picturesque but cramped villages at home and abroad, the yellow beams of an oil-lamp are a comfort to the strange passenger. To put forward street lighting as a special field for the utilization of oil-lamps in competition with gas is, however, to court criticism. Our pages contain many pieces of evidence to show that the successes claimed for street oil-lamps by the makers and other interested parties are not generally endorsed by the public; and if Mr. Anderson had been with the South-Western Gas Managers at Winchester last week, instead of being where he was, in a town where street oil-lamps are not very probable visitors, he would have seen reason to modify his views. It scarcely requires to be demonstrated that, of all places for an oil-lamp to show to advantage, a street lantern is the worst. The wicks cannot be so well trimmed and regulated there as indoors; the oil reservoir must cast a shadow; broken glass causes flaring and smoking; and, at the best, there is an additional thickness of not always clean glass to obstruct the light. However smart they may be at the outset, before they are taken over and paid for by the highway authorities, street oil-lamps invariably sink before long into the state of "smoky "doubtfuls," as a country newspaper editor, who must surely have been inspired for the moment, called those in his own town. Dim lights and greasy posts are the end of experiments with street oil-lamps, as Mr. Anderson would soon find out if he were to inquire into the matter, as he ought to have done before talking about it so confidently. His reference to the "tyranny of great and privileged Com-"panies" may be passed by for what it is worth. Public lecturers get into a way of using remarks of this order without having any clear idea of what they mean to imply; and though loose speaking is a reproach in a scientific man, it is really the lightest stricture that can be passed upon Mr. Anderson for this portion of his address.

Water and Sanitary Affairs.

The sultry heat which has visited London at intervals during the present summer, rendered perhaps the more trying by occasional cold, has not destroyed the reputation of the Metropolis as a generally healthy city. On the contrary, the death-rate has been remarkably limited; falling 2·8 below the average for the first ten weeks of the current quarter. The comparison extends over a period of ten years; and therefore rests on a basis sufficiently broad. Noxious emanations from the sewers have caused considerable annoyance, and an outbreak of enteric fever in a West-end district has created some anxiety. But the character of the water supply has been above suspicion; and nothing has been advanced to show that it is otherwise than perfectly wholesome. At the same time, medical authorities look upon house-cisterns with a considerable amount of disfavour. A Medical Officer of Health, writing to *The Times*, expresses perfect confidence in the quality of the London water when taken direct from the main, "without the intervention of a "storeage tank or filter;" but he is "led to think that "diphtheria is very commonly due to the storeage of drinking "water in the house." The only reason he can give why diphtheria does not attack "the abjectly poor" in his neighbourhood, is that they take their drinking water from a stand-pipe, and do not "rise to the luxury of a house "with a tank and all its abominations." Of course, this view of the case fortifies the argument for a constant supply. The monthly report which has just been issued by Mr. Crookes, Dr. Odling, and Dr. Tidy, refers to the improvement in the London water which took place in July as compared with June. This advance was more than maintained during August—a further improvement showing itself; so that the results are described as "entirely satisfactory." The report of Dr. Frankland concerning July was also of a favourable character. We regret that the removal of Dr. Percy Frankland from London has necessarily led to the cessation of the valuable reports by that scientist on the germs or "colonies" in the Metropolitan supply. But research has gone far enough to prove the goodness of the water; and scientific analysis receives confirmation in the low rate of mortality which prevails in London during the heat of summer. The facts point to the desirability of extending the constant supply as rapidly as possible; and we may remark on the peculiar value of the stand-pipe in thickly populated neighbourhoods, where the state of the atmosphere predisposes to zymotic disease. London is a crowded city, especially in the poorer districts; and its healthy condition implies the existence of a good and abundant supply of well-filtered water.

Complaints as to evil smells from the sewers of London during the recent hot weather have naturally led to a discussion as to the best mode of eliminating sewer gases. Systems of ventilation have been advocated; but unfortunately there has ever been the drawback that the sewer gases continue to exist, and are apt to betray their presence despite all that has been done for their removal. There are modes of sewer ventilation which seem to have the peculiar merit of conveying the obnoxious gases to places where nobody would expect to find them. Not only is a highly ornamental lamp-post in the centre of a roadway a thing to be shunned, but there is a suburban parish, famous for its

leafy honours, in which even the trees are made to serve as supports and hiding-places for the pipes which ventilate the sewers. Experiments have been made with various contrivances intended to neutralize the disagreeable gases as they are on the point of escaping; but the general result has not been satisfactory. A more direct method, which aims at preventing the formation of these gases, has a better promise of success. It is not reasonable to assume that the Metropolitan Board were wrong in everything they did; and it is interesting to look back to the period when "for the purpose of preventing any nuisance "within the Metropolis arising from the discharge of offen- "sive gases from sewer ventilators, the Board authorized "the application of manganate of soda and sulphuric acid to "the sewage as it flowed through the main sewers." Thirteen stations were chosen for this purpose, the first of which came into operation in the month of July, 1885; and we believe the number was ultimately increased to thirty. It was also considered that the river would be benefited, as the discharge from the storm overflows would be rendered inoffensive. When Sir Henry Roscoe came on the scene, as Chemical Adviser to the Board, the process thus commenced was discontinued; though we are not aware that any better plan was substituted. At the present time, manganate of soda and sulphuric acid are applied to the storm overflows, as also to the sewage at the main outfalls, pending the completion of the precipitating works. An interesting piece of confirmatory evidence as to the value of such a method is apparently afforded by the circumstance that, so far as the chemicals are concerned, the same process has been applied to the sewers at Frome, where, after nearly a year's experience, the Engineer to the Local Board certifies to its complete success. It is singular that, in this instance, the process is claimed as the discovery of a gentleman—Mr. E. Harris Reeves, with whom it is the outcome of "several "years devoted to the practical study of the question." No doubt the mechanical appliances employed by Mr. Reeves are of a special nature; but the efficiency of the whole affair is clearly dependent on the chemicals which are brought to bear on the sewage. If such a plan really answers, and is not too costly, it is far preferable to a system of ventilation which simply transfers the sewer gas from one place to another.

We have received from the Secretary of the Society of Engineers (Mr. G. A. Pryce Cuxson) the volume of Transactions of the Society for the year 1888, which is issued under his editorship. In addition to the full text of the papers read during the year (which are fully illustrated by lithographed diagrams), the vacation visits—a special feature of the proceedings of this Society—are fully reported. The book is furnished with a useful general index to the Transactions from 1861 down to last year.

That terror of many gas managers—naphthalene—has just been causing trouble in San Francisco. According to the *American Gaslight Journal*, the municipal authorities of that city complained of a number of the street-lamps being unlighted; and the President of the San Francisco Gas Company was applied to for an explanation. He gave as the cause the stoppage of the pipes by naphthalene—an "obstructive" with which the Company had never, he said, previously had to contend, although it was met with by gas companies supplying eastern cities. The cause of its sudden appearance, when the Company had previously been entirely free from it, was inexplicable. As many as 126 cases of unlighted lamps were reported in one day; and for these, of course, an allowance will have to be made to the city when their next monthly accounts are rendered. The Company immediately set a number of men to work to pump liquid naphtha into the pipes and dissolve the crystals; and possibly by this time all the trouble has been removed—it is to be hoped never to return.

The attention of the younger section of our readers may be usefully directed to the syllabus of the lectures delivered each year in the Engineering Department of the City of London College, Moorfields, by Mr. Henry Adams, M. Inst. C.E., assisted by Mr. R. J. Hatton, M. Inst. M.E., and Mr. S. F. Howlett. These lectures embrace a number of subjects of the highest value to those who contemplate entering the engineering or the architectural profession, and attendance at them is obtainable at very moderate fees, which include free admission to the College reading-room and to the entertainments. Prizes ranging from £1 1s. to Whitworth Scholarships are open to students in Mr. Adams's classes, which, it is scarcely necessary to say, are in union with the Science and Art Department and the City and Guilds of London Technical Institute at South Kensington. The course of study begins in October, and closes in time for the examinations held by these Institutions in May. Mr. Adams (who, as many of our readers are aware, is the senior Vice-President of the Society of Engineers) has shown special ability in the preparation of students for these examinations; and his assistants are both highly-qualified science teachers.

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 566.)

Taking the markets all round, business on the Stock Exchange during the past week has been of very fair proportions for the time of year. The tendency of prices, however, has been variable, and governed by special circumstances. Speculative probabilities have sent some classes up, while hard-fact certainties (such as the strike) have kept others down. The Money Market remains in much about the same position; but a further rise is likely in the not very distant future. As for our special departments—Gas and Water—the signs of renewed activity which seemed to be discernible in the previous week, proved to be only evanescent; for a quieter period than last week we have rarely had to record. At the same time, though transactions were few and far between, there was not the slightest fear of stocks drooping for want of support. On the contrary, variations of price are distinctly favourable. This tendency to rise was well marked in the Metropolitan Companies. At the opening, Gaslight "A" was rather easy; but it speedily improved, and realized good figures—the closing mark, 263½, being equal to the best of the week. There was also a small demand for the 10 per cent. preferences and the "H" 7 per cent., which changed hands at better prices; the quotation of the former improving 1. In South Metropolitans, the "A" has been specially strong; and the quotation has been put up 1, though it would bear a little more raising. Nothing at all was done in Commercials. Among Suburbans and Provincials, British is the only undertaking in which business has been done; and its price is still tending upwards. Brighton and Hove, Bromley, and Tottenham and Edmonton are quoted *ex div.* Of the Foreign Companies, Imperial Continental is firm, and shows a rise of 1; and Bombay and Oriental seem to have quite recovered. Buenos Ayres was the only one to show weakness; and the quotation has fallen back ¼. As for the Water Companies, they have been almost stagnant. Not half-a-dozen transactions have been marked in them during the whole of the week; and nothing has occurred to vary their quotations.

The daily operations in Gas were: On Monday a few transactions in Gaslight issues were registered at moderate figures; but a better price was obtainable for Imperial Continental. On Tuesday, Gaslight "A" was firmer; and Imperial Continental remained the same. On Wednesday, the only feature was that Gaslight "C," "D," and "E" realized the top price. Thursday's prices were not remarkable; but quotations rose—an advance of 1 each being made in Gaslight "A;" ditto "C," "D," and "E;" Imperial Continental; and British. Friday offered nothing whatever to remark. On Saturday, South Metropolitan was done at 316¼; and rose 1 in quotation. Buenos Ayres receded ¼.

ELECTRIC LIGHTING MEMORANDA.

ELECTRICIANS AND PROVISIONAL ORDERS—THE BARRENNESS OF THE BRITISH ASSOCIATION ADDRESSES IN REGARD TO ELECTRICAL SCIENCE—THE PARIS ELECTRICAL CONGRESS—THE COST OF INCANDESCENT ELECTRIC LAMPS.

There is much talk about the activity now prevailing among electricians with the declared intention of obtaining Provisional Orders next year for lighting British cities and towns; but this is a matter that requires to be calmly considered if a right understanding of the indications is to be arrived at. The newspapers, of course, jump to the conclusion that the day of electricity has come at last, and that gas is about to be extinguished altogether; and they proclaim it with the customary expressions of contempt for gas, and gibes at gas shareholders. The fact that the gas committees of several corporations contemplate starting electric light undertakings should be worth something as an indication that the gas interest has in reality nothing to fear from a parallel development of electric lighting. We hold, however, that although there has been a revival of enterprise in respect of electric lighting, as a consequence of the alteration of the Electric Lighting Act, 1882, there is in reality more froth than substance about most of the announcements made of the supposed intention of electric light speculators to apply for Provisional Orders for every town in the Kingdom. Several scions of the House-to-House Lighting Company have been thrown off, for example; and the florid style of Mr. Robert Hammond is traceable in the manner in which these creations, not one of which has its capital subscribed, have threatened wealthy corporations with invasion. The Crompton Company have also distributed notices broadcast; but it would be impossible for them to carry out more than a fraction of their programme. It is easy to understand how notices of this kind disturb the repose of local authorities, who are not to be supposed to know that they are as common as advertisements of soap, and as worthless in many instances. A sufficient number of corporations have now decided to be beforehand with all possible competitors in the prospective business of electric lighting to gladden the hearts of many worthy professional gentlemen, who will thus be sure of a profitable winter's employment, which might not have been theirs if the corporations had not taken alarm.

Neither electrician nor gas engineers are likely to be specially instructed by anything that fell from the readers of sectional addresses at the opening of the British Association in Newcastle. Both would be inclined to look to the President of the Mathematical and Physical Science Section—Captain Abney, C.B.—or to Mr. William Anderson, the President of the section of Mechanical Science, for something more or less in their line; but they have

been doomed to disappointment. Captain Abney had a good deal to say about photography, and he also made a few remarks upon radiation, but the general drift of his address was far away from lighting, whether by gas or electricity. The rule followed by all the sectional Presidents was that of strict specialism. They all scorned to be "popular;" and many even went to the other extreme and became abstruse. Communications relating to electric lighting were, of course, submitted in some of the sectional meetings and will appear in the technical periodicals in due course, but for the present we are compelled to state that the meeting has been singularly barren in respect of the branches of science in which our readers are most directly interested.

The latest Electrical Congress at Paris seems to have been a very mixed affair. There was no important business to be transacted, such as that which occupied the congress of 1881, when the International system of electrical measurements was settled. As a report says, "everybody was welcome;" and it is not necessary to explain what this means in connection with a supposed scientific assembly. The Government, which looks after all such matters in France, took steps to impart an official air to the congress, by procuring the attendance, or at least the nomination of delegates from several of the smaller nations represented at the Exhibition by Commissions; but there was so little distinction attaching to membership of the congress, that the elaborate cards of the members did not even carry the right of admission to the Exhibition. It appears indeed that anybody who chose to pay 20 francs as "inscription fee" was admitted to membership of the congress, and obtained one of these official cards, bearing four signatures, which ought to be worth the money for framing and hanging on the wall of the office of a self-styled consulting electrician. It should be recorded that M. Violle, the proposer of the celebrated platinum standard unit of light that was enthusiastically adopted by a former Parisian Congress of Electricians, and has never been used since by them or anybody else, recommended and prevailed upon this 1889 congress to accept a so-called practical photometrical unit, which he called the *Bougie décimale*—the decimal candle. It is defined as being the tenth part of the absolute Violle unit adopted in 1884—the one that has never been used. Its luminous value is defined as being very nearly that of an English parliamentary standard candle, and also very nearly one-tenth of a Carcel. If this is the case, it cannot be one-tenth of a Violle platinum unit. Practically, however, matters photometrical will remain as they were before M. Violle attempted to improve them. Congresses of more pretension than authority may flatter him with a vote; but something more is needed to do away with the candle or even the Carcel.

A statement respecting the cost of incandescent electric lamps has been published in the *Journal für Gasbeleuchtung*, based upon data afforded by the Darmstadt undertaking. The working expenses of this station are taken; the average number of lamps supplied being 5102, ranging in illuminating power from 10 to 50 candles. The average power is reckoned at 16 candles, however, to correspond with a gas-burner. A large proportion of the lamps are used in the theatre; and the hours of lighting in this case are rather different from those in private houses. Taking everything into consideration, it is calculated that 1,337,500 lamp-hours represent the electric lighting for the past year in Darmstadt. All the items of expenditure are worked out upon this datum, including interest on capital at 3½ per cent. Deterioration is allowed for after the rates of 7½ per cent. on machiney, 3 per cent. on conductors, and 1 per cent. on buildings. This is scarcely enough for the two first classes. As it stands, however, the cost works out to 5·446 pf., or a little more than a halfpenny per lamp per hour, and this is stated to have been under unfavourable conditions of service. The figure corresponds fairly well with what is generally understood to be the cost of 16 candle incandescent lamps in this country; for it is believed by most people who have studied the question that a well-situated incandescent lighting station, fully employed all the year round, ought to be able to supply a lamp of this order at a net cost of about ¼d. per hour, without reckoning lamp breakages. This is about three times the average cost of gas to the consumer, when paying 10 per cent. to the purveyor.

THE CROYDON GAS COMPANY AND THEIR WORKMEN.—The men engaged at the Croydon Gas Company's works celebrated, in a befitting manner, two important events last Saturday week. These were the closing of the yard at 1 p.m., instead of at 4 p.m. as formerly; and the opening of a new building which has been kindly erected for them by the Directors. This consists of a large mess-room, a lavatory, and two bath-rooms, all complete with hot and cold water fittings and other requisites, on the ground floor; and on the second floor the space is devoted to a lofty and well-lighted apartment, capable of seating from 160 to 200 persons, which will be used as a reading and recreation room. The proceedings commenced with a cricket match, followed by athletic sports. Afterwards the men (about 100) sat down to a substantial tea, provided by the Directors; and later on a musical entertainment was given in the recreation-room, at which Mr. J. W. Helps, the Engineer, presided. During the interval, prizes were distributed by Mrs. Helps to the successful competitors in the sports; and at the conclusion, Mr. Cantwell, the Chief Foreman, proposed a hearty vote of thanks to the Directors for their kindness in providing the new building, &c. This was cordially responded to; and the men also acknowledged, in a hearty manner, the great interest which Mr. and Mrs. Helps had shown in the matter.

GAS AND ELECTRIC LIGHT UNDERTAKINGS IN MASSACHUSETTS.

IN the JOURNAL last week we gave some particulars relating to the supply of gas in Massachusetts, as furnished by the last report of the Board of Gas Commissioners of that State. We now continue our notice of the report by extracting some further statistics in regard to the gas industry.

Following the tables giving the price charged for the gas supplied by the various companies (already dealt with) are others showing the bulk of gas made in the year ending June 30, 1888, as compared with the preceding twelve months; the quantities sold by meter and supplied to the public lamps in both these years; the quantities used at the works and offices, and lost by leakage last year; and the percentage of gas unaccounted for in both years. Of the coal-gas companies, Boston heads the list as before; and Danvers is again at the bottom. The following are the most important companies in the list, with their make, sale by meter and for public lighting, and leakage of gas:—Boston: Make, 1,222,228,300 cubic feet; sale by meter, 1,078,622,700 cubic feet; public lighting, 55,171,900 cubic feet; leakage, 6·15 per cent. Lowell: Make, 192,058,000 cubic feet; sale, 176,148,400 cubic feet; public lighting, 7,530,700 cubic feet; leakage, 3·35 per cent. Roxbury: Make, 162,377,500 cubic feet (inclusive of 11 millions purchased from the Bay State Company); sale, 116,086,600 cubic feet; public lighting, 30,358,440 cubic feet; leakage, 9·56 per cent. Cambridge: Make, 117,743,000 cubic feet; sale, 94,840,576 cubic feet; public lighting, 10,662,794 cubic feet; leakage, 9·35 per cent. Worcester: Make, 100,724,500 cubic feet; sale, 86,826,500 cubic feet; public lighting, 4,147,300 cubic feet; leakage, 8·92 per cent. At Charlestown, Dorchester, Lawrence, Lynn, South Boston, and Springfield, the make ranges from 86 down to 57 millions; the production by the remaining gas companies falling to 1,825,700 cubic feet—at Danvers. Curiously enough, it is in this town that the unaccounted for gas is highest (35·12 per cent.); while the figure is lowest at Haverhill (2·52 per cent.), where the make is about 43 millions. In the previous year the percentage of leakage at Danvers was 40·86, and at Haverhill 4·84; so that there has evidently been in both places a movement in the direction of bringing down this item. Of the ten companies supplying oil gas, returns as to the make are given by six only. The highest figure is that of the Chicopee Falls Company—2,070,384 cubic feet, of which 615,680 cubic feet were sold by meter; the quantity used in the mills of the Company not being known. The Leominster, Middleborough, and Mutual (Southbridge) Companies made respectively 1,977,105, 1,007,053, and 1,512,550 cubic feet of gas; the sales by meter being 1,481,550, 865,053, and 1,222,100 cubic feet.

These statistics are followed by tables showing the greatest and least daily output of each company and the date thereof; the total quantity of gas sold in the year, with the percentage of sales; the capital (including bonds) employed per 1000 cubic feet of gas sold; and the average price received for all gas sold, as compared with 1886-7. Taking the five coal-gas companies above mentioned, we find there was a percentage of increase in the sales in each case, to the following extent:—Boston, 6·15; Lowell, 7·37; Roxbury, 7·67; Cambridge, 4·50; Worcester, 14. Of all the gas companies sending returns, there were decreases in only seven cases, though in one (the Greenfield) it was to the extent of 29·66 per cent. With regard to the oil-gas companies, there was a drop of 11·61 per cent. in the sales by the Mutual Company, and of 8·68 per cent. in those of the Ipswich Company, with two other trifling falls; all the other returning companies showing some increase. The average price received per 1000 cubic feet was as follows:—Boston, $1·31; Cambridge, $1·68; Lowell, $1·19; Roxbury, $1·71; Worcester, $1·51. These figures are in each case lower than those for the preceding twelve months. The prices of the oil-gas companies range from $3 (Mutual) to $7·50 (Lee). The quantity of coal gas sold per mile of main in 1887-8 was, of course, highest in the case of Boston, being 8,759,324 cubic feet; the figures for the other four companies being as follows:—Cambridge, 1,320,442 feet; Lowell, 2,725,125 feet; Roxbury, 2,134,767 feet; Worcester, 2,398,667 feet. In the case of the Norwood Company—a small concern with a capital of $2848—there were only 9·4 consumers, burning 306,255 cubic feet of gas, per mile of main. The consumption of oil gas per mile of main was highest with the Chicopee Falls Company (580,830 cubic feet), and lowest with the Lee Company (178,807 cubic feet).

The next table in the report bears upon manufacture, and shows the number of tons of coal carbonized in 1886-7 and 1887-8, the kind and quantities of enricher used by the various coal-gas companies, and the percentage of the cost of coal received from residuals. Again taking the five largest companies, we find that the Boston Company carbonized 106,395¾ tons of coal in the last-named year, as compared with 100,883 tons in the preceding twelve months; the Cambridge Company, 10,147 tons, against 9397 tons; the Lowell Company, 17,050 tons, against 17,327 tons; the Roxbury Company, 14,225 tons, against 13,604 tons; and the Worcester Company, 8087 tons, against 6656 tons. The Boston Company use cannel, Albertite, and naphtha as enrichers; the Cambridge, oil; the Lowell, cannel and naphtha; the Roxbury and the Worcester, naphtha. Cannel is the material generally employed, alone or in conjunction with other enrichers, consisting of gas oil, crude Lima oil, crude petroleum, naphtha, &c. The proportions of the different materials are all tabulated. The percentage of the cost of coal received from residuals was highest in the case of the Lowell Company (60·28), and lowest with the Citizens and Easthampton Companies (5·41 and 5·55). The

figures run generally from 12 to 47 per cent.; the Lowell Company being much above the average. Of the nine oil-gas companies, six use petroleum, two use naphtha, and one employs a mixture of gas-oil and naphtha. Particulars are furnished as to the working of nine water-gas companies, five of whom employ the Granger process; the others using the Evans, Flannery, Loomis, and Lowe processes. The material put into the generator varies; the choice lying between broken coal, coke, anthracite, and bituminous coal. In all cases but one, naphtha is in the enricher used. In the year 1887-8, the Bay State Company made by the Flannery process 12,826,879 cubic feet of gas with 462½ tons of anthracite (inclusive of the coal used for raising steam) and 72,872 gallons of naphtha; the Company next in importance—the Worcester—turning out by the Granger process 10,342,100 cubic feet of gas with 45 tons of Lehigh coal and 137 tons of coke (of which about one-sixth of a bushel was employed for generating steam) and 68,200 gallons of naphtha. It is to be regretted that the only Company (the Cottage City) working the Loomis process did not give the quantities of material employed by them. The Fall River Company, with the Lowe process, made 7,486,000 cubic feet of gas from 204¾ tons of Pittston coal (907 bushels of coke and 2067 bushels of slack and screening being used for generating steam) and 49,960 gallons of petroleum. The Spencer Company adopt the Evans process; their make of gas, using 18 tons of coke (some utilized for raising steam) and 19,921 gallons of naphtha, being 805,600 cubic feet.

With regard to distributing arrangements, the total length of mains laid at the close of the year covered by the report was 1258 miles 687 feet; being an increase of about 60 miles as compared with the preceding year. Of the total increase, 18 miles were due to mains laid by companies coming into the list for the first time; the other 42 miles being distributed over 49 companies. No extension was reported in 21 cases. All the companies made returns in regard to the number of meters, although in the case of the Citizens Company no detailed statement was furnished. There was an increase of 5928 meters and 41,901 lights. The total at the close of the year was 95,015; the capacity ranging from 1 to 500 lights. The sizes most in request are, of course, the 2 to 30 light meters. High-power gas-lamps are used by the consumers in 50 of the companies, in numbers ranging from 239 (in the Lawrence Company) down to a single one. A considerable addition was made to the number of gas-stoves in the course of the year; the Springfield Company having about 200 more than when previously reported upon. The Citizens' Steam and Gas-light Company of Lynn, who sell a non-luminous fuel water gas, had 105 stoves in use on June 30, 1888. There was again a decrease in the number of public lamps last year—to the extent of 636 lamps in the case of the coal-gas companies, and of 29 in that of the oil-gas companies. This makes the loss during the two years from July 1, 1886, to June 30, 1888, 1729 coal-gas and 31 oil-gas lamps—a loss which the Commissioners state is due entirely to the spread of electric street lighting. These figures, however, do not, they add, show the number of public gas-lamps displaced by electric lights; for in most cases the increased use of gas-lamps in the outskirts of towns makes up in a large measure for those displaced in the centre. The greatest loss was experienced by the Malden Company, who report a decrease of 233 lights; the Newburyport Company following with a drop of 150.

Coming to the portion of the report dealing with the quality of the gas supplied by the companies, we find that 458 inspections of gas were made during the year 1887-8; and of the 60 companies subject to supervision, only one failed in respect of illuminating power—the test showing 13·30 candles, as against 18, the standard. In some cases, however, the quality was up to 21·60 candles; the average of all the coal gas companies being 17·60 candles. The average quantity of sulphur in the gas was 9·26 grains, as against 20 grains allowed; and of ammonia 3·07 grains, against the 10 grains allowed. The average illuminating power of the gas supplied by the oil-gas companies was 33·73 candles; the highest being 52·4, and the lowest 21·5 candles. Bearing upon the quality of the gas is the question of its liability to cause accidents to the consumers. One of the Acts passed in the session of last year requires gas and electric light companies to report in writing to the Board, within 24 hours, every accident through gas or electricity which causes bodily injury, or renders an *employé*, a consumer, or any other person, insensible. Under the provisions of this Act three cases were reported to, and one came through the newspapers, under the notice of the Board. With one exception, the parties had been overpowered by inhaling gas which had escaped from burners in consequence of the sufferers' own carelessness, and not through fault on the part of the companies; but in no case were the effects serious. The exceptional case referred to was that of a service-layer, who was rendered insensible while tapping a main.

We now come to an important section of the report—that dealing with the electric light undertakings in the State; but to this we must devote a separate article.

In Mr. Dibdin's return to the London County Council on the quality of the gas supplied in the Metropolis during the week ending the 7th inst., the gas tested at the Blackfriars Road station is reported to have been below the standard to the extent of 0·2 candle on the preceding day; the mean for the week at this station being, however, 16·2 candles.

Notes.

The Poisonous Action of Water Gas.

According to the *Zeitschrift für Hygiene*, 1888, p. 440, an example of the poisonous quality of water gas recently occurred at a hat factory in the neighbourhood of Zurich. The workmen were attacked by various forms of illness—such as headache, dizziness, vomiting, debility, &c.; and the factory inspector satisfied himself that the illness was probably caused by the escape of unconsumed gas. Iron moulds are used to press the felt in the manufacture of hats; and these were heated by numerous small jets of gas of the description furnished by a Dowson gas producer. Some of these jets were very liable to become extinguished, and hence the escape. The author (Heinrich Schiller, of Zurich) was consequently desired to investigate the Dowson gas, with a view to ascertaining the effect of the gas when mixed with the atmosphere, on animals, the least quantity actually fatal to life, the percentage harmful, the toxic agent in the gas, the symptons of Dowson and water gas poisoning, &c. A number of experiments were conducted with cats, rabbits, guinea pigs, and mice, both with Dowson and water gas. The conclusions arrived at are that both gases are strongly poisonous; the symptoms being identical with those of poisoning by means of carbonic oxide gas. They are both devoid of smell, unless sulphuretted hydrogen or other impurity be present. About 1 per cent. of water gas, and 1·5 per cent. of Dowson gas, furnishes fatally poisonous mixtures when present in the atmosphere. Symptoms of poisoning are produced with 0·1 per cent. of the former, or 0·3 per cent. of the latter gas. In non-fatal cases, a rapid recovery usually follows; and the poisonous principle is the carbonic oxide present.

The Inspection of Riveted Work.

The inspection of riveted work is a matter of the greatest importance to engineers, especially in connection with gasholder and girder work, where it is necessary for every rivet to fulfil its appointed duty. In gasholder and tank work, rivets have to discharge a different duty to that which they serve in girders and ironwork structures. They have to hold two sheets or plates firmly together in a tight joint, whereas in structural work they have to bear a shearing strain. In both cases, however, it is a prime necessity that they should fit the holes tightly; and this is one of the points to which an inspector of riveted work must pay particular attention. A loose rivet will only carry from two-thirds to seven-eighths of the shearing strain that can be borne by a tight rivet of the same size; and when loose riveting is found in plate work intended to hold water or gas, it not only means a leaky seam but also leaks round the head and point. The method of testing is by striking every rivet a light blow with a hammer, when the loose ones will be detected either by the sound or by the hammer appearing to cushion against them. Good workmen always try their own work in this way before they leave it; but sometimes a skulker will endeavour to mask his bad work rather than take the trouble to make the rivet good. Sometimes a caulking tool, run round the edge of the rivet head, will prevent the jarring of the inspector's hammer; and unless the marks of the caulking tool are specially looked for, it is difficult to see them. In tank and gasholder work, caulking of rivets is more excusable than in structural work. Another way of tightening up a loose rivet is by placing the snap sideways upon the point, and striking it a smart blow or two with a sledge. It will then appear to be tight—partly because it is bent, and partly because the snap cuts a ridge in the plate and jams the metal against the rivet. Although all rivets so tightened show the cut and ridge made by the edge of the snap, the same mark often occurs in good work; and therefore it is impossible to condemn work simply because of the appearance of this indication. Mr. C. F. Parker, writing on this subject in the *Stevens Indicator*, advises the inspector always to go to the held-up head of the rivet, if possible, instead of to the snapped head. A badly-heated rivet is often loose at the head although snapped tight at the point; and the riveter cannot tamper with the former as he can with the latter. Unfair holes are one of the main causes of loose riveting, and therefore a moderate use of the drift must be permitted in most riveted work, although engineers are generally averse to it.

The Laying of Submarine Water-Mains.

An account of the laying of a line of water-main on the sea bottom of the bay of San Francisco, describes the work as a very remarkable one, both on account of the method of construction of the pipes and of their immersion, which was at an average depth of 46 feet. The length of pipe laid under water was nearly 5 miles. The mains were 16 inches in diameter, made of wrought iron 0·31 inch thick, and 20 feet long. The metal was first of all galvanized; then asphalted; and at the last moment of laying coated thickly with paraffin. The joints were made by cast-iron socket and spigot pieces of special form, bolted to the ends of the sections of wrought-iron pipe. The inside of the socket was made in the form of a circular arc; and the end of the spigot was curved to correspond. This form enabled the pipes to bend through an arc of 15° at each joint without drawing the spigot. The joint was made with compressed hemp yarn and lead, exactly in the ordinary way; and the pipes were laid from a float, which was towed across the bay on the intended line by means of a wire cable. The pipe, as put together, was paid out behind the float; and owing to the mobility of the joints, it hung like a long-link

chain before finally resting in a straight line on the bottom of the bay. The pipes did not bear their own weight, but were suspended to the wire cable by which the float was hauled across the bay, after the principle of floating bridges. The bay was very stormy; but the pipes were laid without accident. They were filled with sea water to prevent their floating, and when the line was completed, and this ballasting replaced with fresh water, the pipes were found to be absolutely tight.

PETROLEUM VAPOUR MOTORS.

Mr. Yarrow, the builder of petroleum vapour engines, the principle of which has at times been noticed and commented on in the JOURNAL, has a foreign rival in M. de Millefeldt, whose French patent is being worked by the Cail Company. The character of the Millefeldt motor is exactly similar to that of Mr. Yarrow, consisting as it does in the production and utilization of petroleum vapour, in the same way as steam, with the advantage that the former acts at the same time as fuel for the serpentine boiler and motor agent in a simple-acting three-cylinder engine. The evaporating portion of the plant stands over the working machinery, so that the whole is very compact, outwardly resembling a vertical steam boiler, all the working parts being enclosed in the base. The working of the engine is started by giving a few strokes to a hand pump, and lighting a small burner. This vaporizes the petroleum into two fractions, heavy and light; the latter going to supply the main burner or furnace, and the former driving the engine. The petroleum, after its utilization as a motive agent, is condensed and used over again; and the apparatus accordingly works almost automatically after it has been started. The quantity of heat to be developed for starting is so small that in three or four minutes the vaporizer is in full work. An engine of 4-horse power consumes 6·7 litres of petroleum per hour. In certain circumstances these petroleum-vapour engines are expected to compete seriously with gas-engines, or at least to confine the latter to their present uses in a fashion that was not thought of a few years ago.

EFFECT OF LIGHTNING ON LOFTY METALLIC STRUCTURES.

Lofty gasholder columns are doubtless frequently struck by lightning; but the occurrence does not leave any trace, because of the good metallic conduction offered by these structures. Still there is a natural degree of curiosity with regard to what happens when a lofty metallic erection is subjected to a discharge of lightning of the kind that is usually so destructive when it strikes buildings of less conducting capacity; and therefore much interest attaches to the report by M. Mascart to the Académie des Sciences upon the effects of a lightning stroke upon the Eiffel Tower at the Paris Exhibition. The tower is provided with a central lightning-rod at the summit, and with eight oblique rods on the third platform; but the terminal of the former had been removed some weeks before the storm in which the tower was struck. This happened at 9.40 on the evening of the 19th ult., when the lightning discharge was accompanied by a sharp detonation of thunder. Some drops of melted iron were shaken off from the point of the rod, and burnt in the air. The eight other lightning rods several times became luminous at the points, and gave off crackling sounds. Nothing else happened; and the incident is taken as showing that a lofty metallic structure is perfectly safe from lightning when, as must naturally be the case, its foundations are deep in the moist soil.

THE RATING OF MACHINERY.—A largely attended meeting of manufacturers from all parts of England was held last Wednesday, at the Grand Hotel, Bristol (Mr. W. F. Fox, of Nottingham, in the chair), to consider the attempts which have been made to assess all kinds of machinery to the local rates, and to consult as to the steps which should be taken to protect the interests of all those affected. It was unanimously resolved that a national society for the exemption of machinery from rating should be formed among the machinery users of the kingdom, for the purpose of assisting manufacturers to resist illegal and excessive assessments. Mr. Humphreys Davies, F.S.I., Rating Surveyor, of the Adelphi, London, was appointed Secretary; and arrangements were made for a thorough organization of the affected interests throughout the country.

THE PROSPECTS OF THE JOHANNESBURG WATER-WORKS COMPANY.—According to *South Africa* (a deservedly popular weekly newspaper, published in London every Saturday), the forty-fifth report of the Johannesburg Water-Works, Estate, and Exploration Company, received by last mail, gives a satisfactory account of the progress made; 17,000 feet of small, and 5000 feet of main pipes having been laid in July. A good quarry of slate—admirably adapted for paving—has been opened up; and the other operations of the Company were being satisfactorily carried on. Our contemporary is also able to announce that a first-class selection has been made of an Engineer to proceed to South Africa to take in charge the important concern of the Company's water-works. "This excellent choice has been due to the energy and tact with which Mr. W. Garland Soper has undertaken to represent the Company in England. The gentleman selected for the important post named is Mr. George Robert Andrews. Mr. Andrews has had a large amount of experience as Engineer and Surveyor in very good positions; and at the time of his appointment by the Johannesburg Water-Works Company was occupying the responsible position of Engineer and Town Surveyor for Brighton. He has also a thorough knowledge of railway engineering, gained during the three years he was District Engineer for the London and South-Western Railway."

Technical Record.

SOUTH-WEST OF ENGLAND DISTRICT ASSOCIATION OF GAS MANAGERS.

HALF-YEARLY MEETING IN WINCHESTER.

The Twenty-fourth Half-Yearly Meeting of this Association was held at the Gas-Works, Winchester, last Tuesday. The attendance of members was fair, though scarcely up to the usual standard; and amongst the visitors were Mr. W. B. Featherstone, of Dundalk, Past-President of the North of Ireland Association of Gas Managers, and Mr. W. R. Cooper, of Banbury, lately Honorary Secretary of the Midland Association. Before commencing proceedings, the party were hospitably welcomed and entertained by Mr. W. U. Tinney, Manager of the Winchester Water and Gas Company, at his house adjoining the works. His efforts were ably supported by Mrs. and Miss Tinney, and were much appreciated by the visitors.

The meeting was opened at one o'clock, under the chairmanship of Mr. J. H. CORNISH, of Bridgwater, President for the year.

The HONORARY SECRETARY and TREASURER (Mr. Norton H. Humphrys, of Salisbury) read the notice convening the meeting; and the minutes of the last meeting were taken as read, on the motion of the PRESIDENT, seconded by Mr. CROWE (Wellington).

FINANCIAL POSITION OF THE ASSOCIATION.

The financial statement for the year ended Aug. 31, 1889, duly signed by the Auditor (Mr. J. Nicholls, of Crewkerne), was then submitted. It showed a balance of £19 10s. 4d. in hand, exclusive of £31 owing to the Association.

Mr. T. HARDICK (Salisbury) thought the statement was highly satisfactory, and reflected credit upon their Honorary Secretary for his able and economical management of their financial affairs. He was sorry, however, to find that so many members were in arrear with their subscriptions. There were no less than 20 unpaid for 1888; and this ought not to be. Instead of £19, there should really have been about £50 cash in hand; and the meeting would then have had to consider how to apply the balance to some useful object. He hoped every member would in future take his fair share of the burden of carrying on the Association, and save the Honorary Secretary the trouble of sending out circulars requesting payment of subscriptions. He had pleasure in moving that the accounts submitted to the meeting be adopted.

Mr. J. LOWE (Weymouth) seconded the motion, and it was carried.

NEW MEMBERS.

The PRESIDENT said that two gentlemen had applied for election as members of the Association: Mr. F. G. Dexter, of Wantage, and Mr. S. Temblett, of Andover. The Committee were unanimous in recommending these applications; and therefore he had pleasure in proposing that Mr. Dexter and Mr. Temblett be elected members of the Association.

Mr. LOWE seconded the motion, and it was carried.

PRESIDENT'S ADDRESS.

The PRESIDENT then delivered a short address, as follows:—

Gentlemen,—To-day my tenure of office expires. I was called most unexpectedly into official existence, and entered upon my duties with great diffidence; feeling sure that, in your corporate wisdom, you had made a profound mistake. Under pressure of your kind expressions, however, my protestations yielded to your unanimous vote. My greatest regret is that I have filled such a dignified position so inadequately, and that I have been of so little use to the Association. If, however, my services have been of the smallest value, I feel more than compensated by the great honour you have conferred upon me.

A letter will be read to-day from Mr. Crowe, resigning his appointment as Vice-President. It has come as a regrettable surprise to the Committee, who anticipated a pleasant year's duties under the genial and intelligent leadership of our much-esteemed friend. The Committee express their sincere sympathy with Mr. Crowe in his precarious state of health; and indulge the hope that he may speedily regain his wonted strength, and that his life may be prolonged for many years to his family, his numerous circle of friends, and to the Association, in which he has from the first taken an uninterrupted interest. If you decide to accept Mr. Crowe's resignation, it will be necessary to elect another gentleman to the office of President, which, according to our law of progression, he would so soon have filled.

As no papers will be submitted for your consideration on this occasion, an opportunity will be afforded of visiting the gas and water works and places of exceptional historical interest in this ancient capital of England.

One of the fundamental objects that the promoters of this Association had in view was the "getting at one another" in the wide and scattered district included in its area. How far this important *desideratum* has been attained may be gathered from the number that have joined our ranks, the attendance at our meetings, and the interest taken in our proceedings generally. As may be seen from a map in the possession of our Secretary, nearly every town in the south-west is now represented on its list of members. That the founders have cause to congratulate themselves upon the success of their efforts, no one will deny. In proof of this, they can refer with pleasure to the number of towns that have welcomed them, the amount of useful information that has been discussed and disseminated among the members, and the proud positions

which several of their number have occupied, and are now filling, in the Council of The Gas Institute. It would be interesting and profitable to tabulate and review the many papers that have been under consideration, as showing the varied amount of knowledge required in their preparation, and also the ever-increasing need of a technical education in connection with our particular industry; for while so much has been accomplished in the past, there probably yet remains much more, in the line of invention and discovery, for future students of gasology.

There are afloat several new matters of interest to each one of us, and to the companies we represent—such as the experiments in the way of popularizing the use of gas amongst the poorer classes now in progress at Ramsgate and in London; our old friend water gas, which has again come to the front in new and grand clothing; lighting by oil and electricity; and many others—all of which are ably treated in the technical papers to which we have access, and to which we are greatly indebted for the accurate information and sound advice usually proffered. The electric light appears to be making steady progress, notwithstanding its cost; but the big bubble blown by financial promoters of water gas has already been pricked.

On the occasion of the last meeting, I ventured to indicate an upward tendency in the price of coal. To those who are not so fortunate as to have bought in advance, the increase is serious, and already means an addition of 2d. per 1000 cubic feet in the cost of gas, after taking into consideration the enhanced value of residuals. As a natural consequence, several companies have found it necessary to give notice of a rise in the price of gas.

I notice with pleasure the presence amongst us to-day of Mr. Featherstone, Past-President of the North of Ireland Association of Gas Managers, and of Mr. W. R. Cooper, of Banbury, who was Secretary of the Midland Association of Gas Managers; and I think I shall only be expressing the feeling of the meeting in extending to these gentlemen a very hearty welcome.

Mr. Featherstone, who was heartily received, said it was a great pleasure to him to make the acquaintance of gas managers in the south-west of England; and this pleasure had been vastly enhanced by the cordial and friendly reception extended to him. As many of those present would be aware, they had for some time past been endeavouring to form a gas managers' association in Ireland; and at last their efforts appeared likely to meet with success. They had now in the north of Ireland an Association numbering 36 members; but they hoped in this respect to soon have a "United Ireland." The annual meeting of their Association had only just been held; but he was sure that any of the gentlemen present who might attend a future meeting, would be heartily welcomed.

Mr. W. R. Cooper, who was also cordially greeted on rising, said that, as an ex-Secretary of the Midland Association of Gas Managers, he might safely express the hearty good wishes of his fellow-members, and repeat the cordial sentiments just expressed by Mr. Featherstone, as coming from the Midland Association. In the Midlands they were not so scattered as in the south-west of England or in Ireland, and could therefore get together more frequently. Considering the distance that some of the gentlemen present had to travel, he was sure it must be gratifying to the Committee to see such a good assembly that day, and especially the President of The Gas Institute (Mr. Garnett), with whom they all felt a deep and warm sympathy in his present affliction. They were meeting that day in a city that boasted many ancient institutions, which many of them would be pleased to inspect or visit; and amongst others, he understood there was a fair specimen of how street lighting had to be done a century or more ago. Friends who had arrived on the previous evening told him that, with the exception of the principal crossings and open spaces, the streets were lighted with oil-lamps, and those of a kind that afforded small flames and very dim light. That matter, however, he intended to stay and see for himself.

Condolence with Mr. Garnett.

The President next alluded, in feeling terms, to the serious illness of Mrs. Garnett, to which passing reference had been made by Mr. Cooper, and proposed that the members should express their sympathy with him therein.

Mr. Hardick seconded the proposition, which was carried by a rising vote.

Mr. Garnett briefly replied.

Resignation of the Vice-President.

The President again referred to the resignation of the Vice-President (Mr. Crowe), on account of ill-health, and read the official letter received from him by the Honorary Secretary. He said although they greatly regretted the impossibility of seeing their esteemed friend in the presidential chair, it was some consolation to know that he would be able to retain his membership, and that they might reasonably hope to have the pleasure of his presence at their meetings for many years to come, and a continuance of that warm interest in the Association which Mr. Crowe had exhibited from the first.

Mr. Crowe said that although the letter and the remarks made by the President clearly explained the position in which he was placed, he should like to be allowed personally to express his regret at having to relinquish the honour of being President, to which he had been looking forward. The effect of the little excitement caused by meeting friends that morning, however, convinced him that the advice tendered by his physician was by no means unnecessary. When he was elected Vice-President last year, he at once—with perhaps some little pardonable pride—mentioned the fact to his Directors, who accepted it as a compliment not only to himself but also to them.

Election of Office-Bearers.

The election of officers for the ensuing year was next proceeded with; Messrs. W. Davis (Poole) and E. C. Riley (New Swindon) volunteering to be Scrutineers. Having collected and examined the voting-papers, they announced the results as follows:—

President—Mr. J. J. Jervis, of New Swindon.
Vice-President—Mr. R. Ashton, of Barnstaple.
Members of Committee—Mr. J. H. Silcox, of Pembroke Dock; and Mr. D. Irving, of Bristol.
Hon. Secretary and Treasurer—Mr. N. H. Humphrys.
Auditor—Mr. J. Nicholls, of Crewkerne.

Place of Next Meeting.

Mr. J. J. Jervis, who was received with applause, expressed himself deeply sensible of the honour offered to him by the meeting, and promised that nothing should be wanting that was in his power in the way of efforts to promote the welfare and prosperity of the Association. At the same time he could not but regret that, on account of the indisposition of their friend Mr. Crowe, he had been somewhat suddenly thrust into office. He would have much preferred the usual preparatory course as Vice-President, and especially under the leadership of their respected friend. He would take the opportunity to suggest that the next meeting should be held at Swindon—a town which enjoyed the unique honour of sending four members to the Association. Between them all, and especially with the help of their friend Mr. Riley, he thought a useful and enjoyable programme could be arranged. He might also add that Swindon had improved since the Association met there six years ago.

The President said he was sure that after so kind an invitation they could not do better than accept it; and he proposed that the next meeting should be held at Swindon.

Mr. H. Sainsbury (Trowbridge) seconded the proposition.

Mr. E. C. Riley (of the G. W. R. Gas-Works, Swindon) heartily supported the proposition, and promised to assist Mr. Jervis in any way in his power. If the Association decided to look in at his works, he hoped to be able to show them a 104-feet gasholder working without guide-framing to the upper lift.

It was then unanimously decided that the next meeting should be held at Swindon.

Papers for the Next Meeting.

In response to the President's request for promises of papers for the next meeting, one of the newly-elected members—Mr. F. G. Dexter, of Wantage—undertook to read one; and Mr. Riley gave some hope of being able to follow suit.

Votes of Thanks.

The President said he had great pleasure in proposing that the best thanks of the meeting be tendered to the Winchester Water and Gas Company for their kind reception of the Association, and also to Mr. Tinney for his endeavours to promote the comfort and pleasure of the visitors, which had been eminently successful. He need not say that it was a great treat to visit Winchester. Apart from the benefit that they would derive from observing the expedients by which Mr. Tinney, though labouring under great disadvantages in respect to ground-space at the gas-works, had been able to meet the demands of his large and increasing district, and also the excellent arrangements for securing an ample water supply of undoubted purity, there were many outside attractions. The inspection of the gas-works was, of course, their chief object; and he might say that their half-yearly visits to different works were most helpful to all the members.

Mr. Garnett said it was 42 years since he had been to the Winchester Gas-Works; still he could very heartily reciprocate the kindly way in which the Association had been received by Mr., Mrs., and Miss Tinney in their beautiful home. The Winchester Water and Gas Company had allowed them to meet on their premises, and inspect their works; and therefore he cordially seconded the proposition.

The proposition having been carried with applause,

Mr. Tinney said that, on the part of his Directors, he thanked the meeting for the kind manner in which the vote had been received. His Chairman (Mr. W. B. Simonds) had desired him to explain that, but for a pressing engagement in London, he would have been present that day. As regarded himself, he was much gratified at such a cordial expression of good feeling. Personally he should have liked to see the members at Winchester years ago; but really felt ashamed to ask them to come, having nothing special to show them. It afforded him great pleasure to meet the Association on his own ground; and if they chose to repeat their visit on a future occasion, he should be glad to see them.

Mr. S. W. Durkin (Southampton) said he had a vote of thanks to propose, and one that needed no eulogizing on his part, for they all knew how well and faithfully their Honorary Secretary and Treasurer had discharged the duties of his office. By his exertions, their financial affairs were in a satisfactory state, and they had a good balance in hand. In proposing this vote, he was requested to add that the Committee unanimously recommended that an honorarium of ten guineas be offered to Mr. Humphrys in recognition of his services to the Association.

Mr. HASTINGS seconded the proposition, and it was carried unanimously.

Mr. HUMPHRYS, in responding, after expressing his appreciation of the kindness extended to him by the Committee and the members generally, said that the need for gas managers' associations increased day by day; and he invited the members, one and all, to do their best in advancing the work of the Association.

Mr. H. SAINSBURY (Trowbridge) said that before the meeting closed there was one matter that would commend itself to all, and that was a vote of thanks to the President, Mr. Cornish, for the very able way in which he had discharged the duties of his office during the past year.

Mr. HARDICK seconded the proposition, and it was carried with applause.

The PRESIDENT having briefly replied, the business closed.

VISIT TO THE GAS AND WATER WORKS.

The party then proceeded to visit the gas and water works, under the guidance of Mr. Tinney. The gas-works suffer from the disadvantage of having become much "too big for their clothes." They are situated almost in the heart of the city; and the land on every side is occupied and unavailable for the purpose of extension. The gasholders have long been banished to other parts of the district; and there are two separate gasholder stations—one near the railway, and the other on the opposite side of the city. Other expedients have been necessary, from time to time, in order to make the best of the limited space at disposal. A considerable portion of the site is occupied by a large and lofty building, the ground floor of which serves as a coal-store. On the first floor, at a considerable elevation, are the purifiers. This floor is formed by iron girders, with turned arches of brickwork between, and covered with concrete. It is supported by cast-iron columns, and by substantial brick piers. Above the purifiers, there is a third floor, which acts as a revivifying shed. This building occupies the right-hand side of the yard. On the left is the retort-house, containing ten beds of eight 16-inch round retorts in each, and also the boilers. These occupy the whole length of that side; so it would be difficult to find room for further retorts in the event of more being required. On the cap at the top of each ascension-pipe is fitted a swan-neck of ¾-inch wrought-iron pipe, carrying a small funnel at the upper end. Above this is a water-pipe, with a tap for each funnel, by means of which a continuous supply of water can be maintained to the interior of each ascension-pipe. This device is found to be successful as a preventative of choked pipes; but the funnels, taps, &c., are apt to get clogged with soot and dust.

From the retort-house the gas passes to an upright pipe-condenser of the ordinary pattern; and thence to a piece of antiquity in the shape of a wet-lime purifier of the aboriginal pattern, which now does duty as a tar extractor. The gas, admitted by a pipe entering at the centre of the top, flows down under a plate which is immersed in ammoniacal liquor. The space above the plate is filled with breeze; and the gas, bubbling up at the sides, has to pass through the interstices of the breeze, in order to reach the outlet. The next piece of apparatus is one of Paddon's washers; and after this are four small scrubbers, formed of the outer shells of an annular condenser. This apparatus was found to give unsatisfactory results in its original form, being liable to choke up. It was therefore rearranged; the interior pipes being removed, and trays substituted. Nos. 1 and 4 are dry scrubbers; Nos. 2 and 3 receive a supply of liquor. The washing and scrubbing is completed by a scrubber of larger size. The gas then passes to the purifiers, which are four in number, each 24 ft. by 12 ft. in area. As the crowded nature of the surrounding land renders the use of lime impracticable (and apart from that there is really no room for a lime-store and mixing-floor), oxide is the only material used in the purifiers. The absence of lime is compensated for, as far as possible, by the extensive washing and scrubbing plant. There is really no accommodation for more than a very limited quantity of coke; but fortunately the undertaking is not a Gas Company only, but a combined Gas and Water Company, and the boiler-furnaces at the water-works form a convenient receptacle for surplus coke.

Having closed the inspection of the gas-works, a steady uphill walk of ten minutes' duration brought the visitors to the water-works, which are on a high level, and command a beautiful view of the city, with its numerous ancient buildings, and modern Guildhall, and of a wide stretch of open, breezy, hill country beyond. A new chimney-shaft of red brick, with pediment, stone string course, and cornice, is one of the prominent objects on entering the works. It is square and tapering in section, and its elegant proportions were generally admired. Its decorations were in harmony with the buildings, which are all of red brick, with facings, &c., of black bricks. In the more modern parts, ornamental tiles and terra-cotta mouldings have been introduced with excellent effect. There are three wells, two 180 feet deep, and the third 140 feet deep. The latter also comprises a bore-hole 11 inches in diameter by 100 feet deep. The wells are all connected by transverse passages of oval section, 6 ft. by 4 ft., and extend for their whole depth through chalk, which at this part comes within 2 feet of the surface. Adits are driven from each well, in some cases extending a considerable distance. There is a plentiful supply of water of excellent quality, free from organic impurity, and not exceeding 15° of hardness. The plant comprises three boilers, all of the Cornish type, with Galloway tubes. Two are of wrought iron, 18 feet in length and respectively 6 feet and 7 feet in diameter; the third is of steel, 24 feet long by 8 ft. 6 in. diameter. The engines are three in number, and comprise one 30-horse power high-pressure, one 60-horse power compound, and one 70-horse power compound. The first two were made by Messrs. Easton and Amos; and the third by the Lilleshall Company. The 60-horse one drives 14-inch plungers, and is capable of raising 700 gallons per minute; and the 70-horse one, with 16-inch plungers, will raise 850 gallons per minute. The pumps are situated about 165 feet below the ground level in each case. The two large engines raise water from the wells; and the 30-horse one is used for the high-level service. There are two covered reservoirs on the site; one capable of containing 300,000 and the other 500,000 gallons.

At three o'clock the party returned to the George Hotel, where dinner was served. Mr. Cornish occupied the chair, and was supported by Mr. Featherstone, Mr. Cooper, Mr. Hardick, Mr. Crowe, and others. After dinner a short toast-list was gone through.

THE STREET LIGHTING IN WINCHESTER.

Apropos of the street lighting of the city, referred to by Mr. Cooper, the description of the oil-lamps is by no means exaggerated. The principal crossings, &c., are well lighted by Bray's or Sugg's lamps; but the remainder of the streets are furnished with small oil-lamps apparently of the kind used in artizans' cottages, which furnish a light varying from about 8 candles when freshly trimmed, down to nothing, as sometimes the lamps go out entirely. An excellent advertisement is thus afforded for the gas, which shines brilliantly from the large lanterns, at great advantage as compared with the miserable appearance of the other lamps, which are furnished with round flat receivers of common moulded glass. The "oil" in them is as dark as treacle; and the base of each lamp is consequently in complete shadow. It was suggested that the Town Council must be very easy-going so far as the lighting contractor is concerned; but further inquiry elicited the fact that they buy the oil and employ lamplighters themselves. The result is that the City of Winchester is lighted in a manner that would not be tolerated under different circumstances or in any manufacturing town.

THE USE OF SODA IN THE TREATMENT OF AMMONIACAL LIQUOR.

One of the papers read at the recent congress of the Société Technique du Gaz en France was on the above subject; the author being M. Ed. Melon. As his communication bears closely upon the subject of the article on M. Chevalet's system for the concentration of ammoniacal liquor which recently appeared in the JOURNAL (*ante*, p. 453), an abstract translation may be of interest in connection therewith.

M. Melon commences by referring to the paper read by M. Chevalet at the Boulogne congress of the Society last year, on the decomposition of ammoniacal salts by cold treatment with lime, in which he showed the possibility, by means of his process, of having only clear liquid to deal with in the stills. The advantage resulting from this system is the absence of deposits or incrustations in the apparatus; but, on the other hand, there is produced a muddy residue, of which it appears to be difficult to get rid. This residue caused some trouble to M. Melon, who adopted the process a few years ago at one of his stations at Lille. He points out that in small works this matter would be of little moment; but where something like a million gallons of liquor have to be treated every year, the question of disposing of the residual lime becomes one of considerable importance, and may, in fact, militate against the adoption of the lime process. This fact led M. Melon to turn his attention to the use of soda in the stills; and it was the results of a year's investigations and experiments on a large scale that he laid before the members of the Society.

The author found soda possessed the following advantages, as compared with lime:—(1) The solubility of all the salts, without exception, so that they could be run off with the residual liquor; (2) the entire absence of nauseous and obstructive deposits; (3) the possibility of introducing the soda into the apparatus in a state of solution of known strength, and in quantity limited to that which has been found necessary after chemical analysis; (4) the applicability of the system to all distilling appliances, whatever their form, without necessitating any alteration beyond the addition of a hermetically-closed tank. Into this tank is run the liquor from the condensers (the capacity of the receptacle being so proportioned that it can be filled two, three, or four times, as circumstances may require, during the 24 hours); and to it is added, in measured quantity, the soda solution—the whole being mixed together by any ordinary agitator. The soda employed by M. Melon was Solvay soda—a pure carbonate. This substitution of carbonate for caustic alkali, the author says, is possible in two cases: (1) When it is required to concentrate the liquor simply; and (2) when the liquor is distilled for the production of sulphate or chloride of ammonia. In both these cases the ammoniacal carbonates formed volatilize, or even dissociate, at about 55° C. If, however, it is desired to make caustic ammonia, the substitution above mentioned would not be possible.

In the works in which this process was adopted, the apparatus was put up with the view of concentrating the ammoniacal liquor either by means of the Solvay plant or by distilling columns. The liquors treated had a specific gravity of from 2·5° to 3° Beaumé, and contained about 50 grammes of fixed ammonia per hectolitre (say 35 grains per gallon). Before the employment of the soda, the residual liquor contained 41·3

grammes of fixed ammonia. These results, the author remarked parenthetically, showed that a certain amount of ammonia was driven off in the ordinary distilling apparatus. The concentrated liquors contained 115 grammes of fixed ammonia per hectolitre; and consequently they had been concentrated to the extent of about one-eleventh. According to theory, the quantity of soda to be employed should be 53 grammes for every 17 grammes of ammonia contained in the fixed salts. In practice, however, three times as much as this is used. In the earlier stages of the trial, the author calculated the amount of soda to be added according to the quantity of fixed salt in the liquor to be dealt with. Under these conditions, he obtained residual liquor containing at the most 10·3 grammes of fixed ammonia per hectolitre. But it had an alkaline reaction; and there was an excess of soda in it. By calculating the quantity of soda according to the amount of fixed salt in the residual liquor (when neither lime nor soda is used in distillation), the proportion of the reagent may be reduced, and a neutral residual obtained containing a maximum of 5 to 6 grammes of ammonia, in the state of fixed salt, per hectolitre.

M. Melon noticed that the temperature at which the distillation of the liquor was effected influenced very materially the quantity of ammonia contained in the residual liquor. He cited the following figures in illustration of this fact:—With the temperature of the liquor at 90°, 95°, 98°, and 100° C., the amount of ammonia per hectolitre was respectively 10·40, 8·75, 5·15, and 4·05 grammes. Apparatus of the Solvay type, in which the boilers are heated by open fires, as also distilling-columns heated directly, allow of a temperature of 95° to 100° C. being attained; whereas when steam is used for heating it is difficult to exceed 90° to 95°. The former appliances, therefore, are the best in working. The specific gravity of the liquor to be treated should vary as little as possible; a density of 2·5° Beaumé giving the best results in practice.

The question may be asked whether, from an economical point of view, it is worth while to endeavour to recover the combined ammonia, instead of allowing it to be carried away with the spent liquor. M. Melon considers the advantage to be very trifling. It depends entirely on the prices of ammonia and soda, and on the proportion of fixed salts allowed to run away with the spent liquor. At the time M. Melon's paper was written, Solvay soda was worth about 18 frs. per 100 kilos. Consequently, if, by the soda treatment, 15 grammes of ammonia per hectolitre are left, this operation does not present any advantage, even if ammonia is worth 55c. or more per kilogramme. The process of complete decomposition by the aid of soda does not present any difficulty in carrying out; but M. Melon considers that it is economical only within rather narrow limits.

THE PHOTOMETRY OF ELECTRIC LAMPS.

In our "Electric Lighting Memoranda" last week, reference was made to the International Congress of Electricians recently held in Paris, and to a paper on the photometry of electric lamps, read by M. Crova on the first day of the meeting. We could only then allude in the briefest possible manner to M. Crova's contribution to the proceedings of the Congress; and therefore to-day reproduce from *Engineering* the following abstract thereof.

M. Crova desired to have definitions of the normal *régime* of an incandescent lamp, of its colour tint, and of its illuminating power. As to the first, he suggested the conditions (voltage) under which the lamp gives the normal colour tint of a Carcel or other standard lamp. The manufacturer should, he thought, be required to state this normal *régime* for every lamp—a demand which is hardly feasible, as it depends upon the peculiarities of the installation and the respective charges for energy supplied, lamps, &c. For photometric measurements, M. Crova compares the curved areas of the spectra, the length of the spectrum giving the abscissæ, the intensities of the different rays of the ordinates, as functions of the wave length. Sunlight and the Carcel lamp have a common ordinate at a wave length of 582, equal to a millionth of a millimetre, which can be realized by letting the light pass through a solution of iron and nickel chlorides (22·321 grammes of Fe_2Cl_6 + 27·191 grammes of $NiCl_2$ dissolved in 100 c.c. of water at 15° C.). M. Crova's suggestions were submitted to a Committee, whose proposals were afterwards sanctioned by the congress. The photometric comparison with the normal is to be effected in the following way:—The intensity is determined for green rays of about 582 wave length by examining the light through a solution 5 millimetres thick made as above mentioned, which must be kept properly saturated with chlorine, and must not be filtered. This gives the intensity a. The intensity b of the red rays of $\theta = 657$ is then determined by examining the light through a red glass of cuprous oxide. The quotient $\frac{a}{b}$ is called the degree of incandescence of a lamp; and the congress recommends that this should be stated, together with the corresponding illuminating power of any lamp, the latter to be expressed in the new decimal candle. M. Crova himself does not favour the Carcel as a normal for these photometric tests, as it has rather a reddish tint. Compared to the Carcel, the red tint of the sun would be 0·5; that of Drummond's lime-light, 0·94. Hence M. Crova suggests a value between these two—for instance, 0·9 Carcel. The horizontal intensity is determined by revolving the lamp about its vertical axis in the same photometer, which need not be of any special construction—a slide with the red glass and the cube containing the solution being added. Green glasses unfortunately cannot be employed instead of the chloride solution, as their spectra differ very considerably.

It appears that the paper did not give rise to any very valuable discussion, as there were few specialists on photometric questions present on the occasion.

TWO MEETINGS OF AUSTRIAN AND GERMAN GAS AND WATER ENGINEERS.

With the view of keeping our readers acquainted with the subjects which engage the attentiion of gas and water engineers on the Continent, we give to-day condensed reports of the proceedings at the last general meetings of the Austro-Hungarian Society of Gas Engineers and the German Association of Gas and Water Engineers; the particulars being, in the case of the first-named Society, obtained from the *Gastechniker*, and in that of the German Association, from the *Journal fur Gasbeleuchtung*.

Austro-Hungarian Society of Gas Engineers.

This meeting took place in Innsbruck, and was opened in the usual manner with business and formal matters. The President (Herr Nachtsheim), in his address, reviewed the illuminating industry in general. He referred to the progress of electric lighting, and to the driving of dynamos by steam, gas, and water power—the latter being employed at a works in Innsbruck, where a good head of water is turned to account by means of a turbine. Incidentally, he noticed that the anticipated reduction in the consumption of gas, which it was feared would accompany the increased application of electric lighting, has not been witnessed. For instance, in Berlin, among other places, the gas consumption had shown a noteworthy increase in spite of extensive electrical installations. After a few words on water and Dowson gas, the President drew the attention of the meeting to the importance of gas for motive power and heating purposes, and to the excellent qualities of high-power burners, and their significance as opponents of the electric light. The address concluded with some general remarks on the present position of the gas industry.

Herr Blum then gave an account of the treatment of gas liquor by the Grüneberg-Blum patent ammonia-producing apparatus, in which the liquor is brought into contact with steam. Herr Ginzel expounded, in an exhaustive and interesting manner, the "Conditions of Stability of the Walls of Gasholder Tanks." The uselessness of many of the published formulæ, in view of the construction of the gigantic gasholders of the present day, was demonstrated. The importance of a suitable material for the backing of walls, to prevent collapse by pressure, was referred to; and special attention was drawn to the use of iron and cement for the construction of gasholder tanks. In conclusion, Herr Ginzel dilated on the capacity of the walls for resisting the strain they have to sustain by the guide-columns and the crown. Herr Blum gave some details of the Drory washer, which caused an animated discussion, and elicited some interesting remarks from Herr Ginzel.

After the conclusion of the ordinary business, the President expressed a wish to retire from his presidency of the Society, owing to his work being now away from Vienna. This announcement was received with great regret. Herr Bauer was elected President; Herr Nachtsheim being made Honorary President. The meeting concluded with visits to works, and a pleasure trip in the neighbourhood of Innsbruck.

German Association of Gas and Water Engineers.

The Twenty-ninth Annual Meeting of this Association was held at Stettin. This is the first time the Association has visited the shores of the Baltic Sea; and the reception the members received was worthy of the occasion. The business meetings were held in the Concert and Club House.

On the first day several interesting papers were read. The first was by Herr Reissner, "On the Construction of Gasholders." This communication was listened to with considerable interest, inasmuch as the subject has been greatly neglected in Germany; and, moreover, the author delivered it in an attractive manner. Herr Schiele next read the report of the Photometric Committee, in which it was remarked that the continued activity of the Association in endeavouring to systematize photometric work and make it trustworthy, had encouraged others to turn their attention to this important branch of the gas industry. At any rate, the subject had been ably treated by both Dr. Lummer and Dr. Loewenherz. The day's proceedings terminated with a paper "On the Supply of Electricity to Towns," by Herr O. von Muller. The many important statements and details expressed by the author, would have given rise to an animated debate had time permitted.

The second day was devoted to the discussion of questions relating to the "Connection of Lightning Conductors with Gas and Water Pipes." Many members were of opinion that it should not be allowed at all; whilst others thought it might be permitted under definite regulations. The Committee appointed by the Association to inquire into the subject have suggested suitable conditions; nevertheless the majority of the members, although agreeing with the Committee, considered that, as regards the gas and water supply systems, the practical adoption of all the precautions cannot be acknowledged as necessary in every case, nor could all of them be generally recommended.

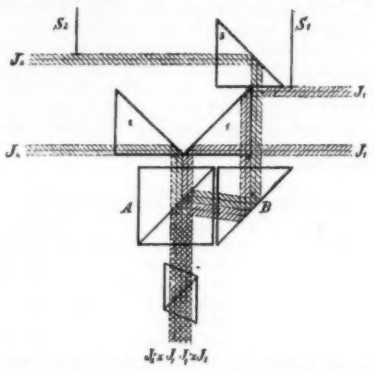
At the third sitting, Professor Riedler read a paper on "The Improvements in the Construction of Water-Works Machinery;" and the reports of the Committee on Water-Works were received. The statistical and chemical data furnished were very interesting

(especially the latter), since, following out the suggestion made by Herr E. Grahn at the Stuttgart meeting last year, there were the first set of results of the chemical examination of the various waters obtained by the use of the similar methods, and expressed in the same manner, and so constituted the first really comparative survey of the chemical character of the waters supplied to the most important German towns.

Supplementary to the official meetings were the visits to various works thrown open to the members of the Association; among them being several gas, water, and fire-brick works. The official business closed on the third day with the usual annual dinner; and the fourth day was devoted to a pleasure trip on the Oder, to Swinemünde and Häringsdorf.

GROSSE'S POLARIZATION PHOTOMETER.

In this photometer, which was described at the last meeting of the Association of German Gas and Water Engineers at Stuttgart, the inventor (Dr. W. Grosse) has availed himself of the well-known property of Iceland spar to polarize a ray of ordinary light into an "ordinary" and an "extraordinary" ray, vibrating in



planes at right angles to each other. A description of the instrument appeared in the *Journal für Gasbeleuchtung*. A quadrangular prism of Iceland spar A, cut across diagonally so as to leave a layer of air between the two halves, is set next to B, which is half a similar prism, in such a manner that the base of the half prism B is in a plane parallel with the bases of the two halves of A; and three glass reflecting prisms are placed in suitable positions, for directing the course of the rays of light emitted from the sources of light J_1, J_2 which are being compared. Two beams from J_1 are reflected by the first glass prism, so that one beam passes through the spar prism B, and the ordinary polarized ray is reflected from the base of B, and suffers subsequent reflection at the junction of the two halves of A, which directs it towards the point of observation. The other beam, from J_1, is also reflected by the first glass prism, but passes into the spar prism A. The ordinary ray will be deflected as we have shown; whereas the extraordinary ray proceeds in a straight line through both halves of A, and takes a course parallel to, and alongside of the ordinary ray from the first beam. In a similar manner one beam from the other source of light, J_2, is reflected by the second glass prism, passes into A, and its extraordinary ray proceeds straight through A, and mixes with the ordinary ray from J_1. The second beam, from J_2, is caused by the third prism to enter prism B, and thence to deliver an ordinary ray to mix with the extraordinary ray of J_1. The field of vision is thus illuminated on one half by the ordinary ray from J_1, mixed with the extraordinary ray from J_2; whilst the other half receives the ordinary ray from J_2, and the extraordinary ray from J_1. By interposing a Nicol prism the ordinary and extraordinary rays may be extinguished alternately; but the light from both sources will be affected in the same way. Therefore, when the distances of the sources of light are properly adjusted, the two halves will remain of equal brightness while the Nicol prism is revolved. In this way the arrangement constitutes a kind of automatic check on the accuracy of the adjustment, besides affording the great advantage derived by having the two halves of the same colour; for as the lights from the two sources are mixed in the same proportions on both halves, it evidently does not matter how much the original lights may differ in colour from one another, as the mixtures of them will be alike in colour.

The calculations for ascertaining the relative illuminating power of the two sources of light are simple, and are represented by the following expressions, in which l_1 and l_2 are the respective distances of the lights J_1 and J_2 from the instrument; x being the light lost during the course through the extra spar prism—an error which is eliminated when light from each source passes through both A and B:—

$$\frac{J_2}{l_2^2} + \frac{xJ_1}{l_1^2} = \frac{J_1}{l_1^2} + \frac{xJ_2}{l_2^2}$$

$$\frac{J_2}{l_2^2}(1-x) = \frac{J_1}{l_1^2}(1-x)$$

So that the relative illuminating power is—

$$\frac{J_2}{J_1} = \frac{l_2^2}{l_1^2}$$

By means of the screens S_1, S_2, the ordinary rays from both or either of the sources of light may be excluded. If one of the lights only is excluded, then one-half the field will be illuminated with mixed light, whilst the other half will receive simple light. Under these circumstances, the following expressions will represent the calculations required to determine the relative illuminating power of the two sources of light when they are adjusted so as to have both halves of the field of vision equally bright. The ordinary ray from J_2 is supposed to be excluded; then—

$$\frac{J_2}{l_2^2} + \frac{xJ_1}{l_1^2} = \frac{J_1}{l_1^2}$$

$$\frac{J_2}{l_2^2} = \frac{J_1}{l_2^2}(1-x)$$

So that the relative luminosity is—

$$\frac{J_2}{J_1} = \frac{l_2^2}{l_1^2}(1-x)$$

Besides the advantages of colour and check on the adjustment already alluded to, with this instrument the effective illuminating power of both sources of light, and with it the length of the photometer, can be conveniently redetal.

PREVENTING THE THICKENING OF TAR IN THE HYDRAULIC MAIN.

In a recent number of the *Journal of the Society of Chemical Industry*, the following abstract translation was given of an article in the *Journal für Gasbeleuchtung* on Herr Langen's system for preventing the thickening of tar in the hydraulic main:—

The author has previously drawn attention to the fact that the seal in the hydraulic main produces considerable variations of pressure in the retort. The gas first drives out the liquor in the dip-pipe, and then forms a large bubble at the mouth of the pipe; the pressure in the retort being thereby increased. As soon as the bubble has attained a certain size, it rises to the surface; forming temporarily an open channel between the retort and the hydraulic main, so that the pressure in the retort is again diminished. Eventually the liquor again rises in the dip-pipe, and the whole process is repeated. Distillation takes place, therefore, under a pressure which varies constantly between *nil* and a maximum; the latter being generally considerably greater than that due to the seal alone. Diminished production and partial decomposition of the heavier hydrocarbons result. The carbon thus produced is partly deposited as carbon on the walls of the retort, and partly in the ascension-pipe. During the rise of the liquor in the dip-pipe the gas either ceases to move, or there is a backward movement favouring the accumulation of tar and carbon in the ascension-pipe. The area of the latter is consequently diminished; causing a further increase of pressure in the retort, and greater decomposition of the heavier hydrocarbons. Some of the carbon also collects on the interior of the dip-pipe; diminishing the area, and causing increased pressure. The remainder of the carbon mixes with the tar in the hydraulic main—making it much denser; and the heavier particles sink to the bottom, where they gradually accumulate, and may ultimately reach the mouth of the dip-pipe.

In order to distribute the gas over a much larger surface of the liquor in the hydraulic main, the author recommends the following arrangement:—The dip-pipes are not cast in one piece with the bridge or H-pipe, but hang vertically in the hydraulic main, on to the cover of which they are fastened with screw bolts. They are 25 centimetres in internal diameter, 80 in circumference, and 4·9 square decimetres in area; whereas those usually employed at the present time are 12·5 centimetres in internal diameter, equal to an area of 1·22 square decimetres. The equal-limbed bridge-pipe is provided with two self-closing eccentric pressure covers for cleaning purposes. It is, on the average, 15 centimetres in internal diameter; the connecting-pipe being generally even larger. By this arrangement the pipes have all the same dip, and their area is increased fourfold; so that only one-fourth of the gas produced comes into contact with a given surface of the liquor, and the surface of gas exposed to washing is double what it was before. The variation of pressure in the retort is in this way considerably diminished.

The thick tar can be readily removed during working by an arrangement which can be easily adapted to any existing hydraulic main. At one end of the main the cover is removed, and a small tank of the same shape as the main is screwed on with bolts. The tank is open above, and is in direct connection with the tar by means of an opening below. A screw is placed longitudinally at the bottom of the main, and rests in thrust-blocks placed at opposite ends of the tank. Its axis projects into the tank, and is there connected with a driving-wheel by means of bevel-gearing. It is also provided with a chain-and-bucket arrangement—the number of the buckets being regulated according to circumstances; and in this way the tar is emptied into a small tank, from which it runs directly by a large inclined pipe to the tar-well. The machinery is worked at stated intervals by hand, or continually by steam power, and the thick tar is thus removed as fast as it is formed, so that only liquor and light tar remain in the hydraulic main. With this arrangement the level in the main can be kept constant, or the seal can be entirely taken off during carbonizing.

THE Campbell Gas-Engine Company, Limited, obtained the silver medal (the highest award) for new and novel implements exhibited at the Staffordshire Agricultural Show, held at Walsall on the 27th and 28th ult.

TECHNICAL GAS ANALYSIS.

In a communication to the *Zeit. Anal. Chem.* Vol. XXVIII., p. 269, *et seq.*, Winkler confirms the statement of Drehschmidt that a cuprous chloride solution which has absorbed much carbonic oxide will give up part of it again to another gas, and supports the proposal to always treat the gas twice with cuprous chloride, using on the second occasion a solution which has not previously absorbed more than traces of carbonic oxide. An ammoniacal solution of cuprous chloride shows a similar tendency, but in a less degree, especially if kept for some time, as the dissolved monoxide is slowly oxidized. Very minute quantities of carbon monoxide can be detected by absorption in cuprous chloride, and subsequent addition of sodio-palladious chloride, when palladium separates as a finely-divided deep-black precipitate. It is best to dissolve the cuprous chloride in a saturated solution of sodium chloride with a few drops of hydrochloric acid; and after absorption of the carbonic oxide, to add water until cuprous chloride begins to separate —about 4 volumes—before adding the palladium solution. By this means 0·61 c.c. of the monoxide can be detected. Fuming nitric acid cannot be used for the absorption of ethylene or benzene in presence of carbon monoxide, since the latter is oxidized by fuming nitric acid. Fuming sulphuric acid absorbs both of these hydrocarbons better than either nitric acid or bromine.

A modification of Coquillon's apparatus is used for the determination of methane. Two stout wires of varnished brass are passed through the cork of a Hempel's tubulated gas-pipette, so as to reach within about 2 cm. from the top. Their ends are connected by a spiral of platinum wire 0·35 mm. thick, heated by the current from two small Groves cells. The gaseous mixture, from which everything has been removed except hydrogen, methane, and nitrogen, is first mixed with excess of air and passed over gently heated palladium-asbestos, for the purpose of removing the hydrogen. This is burnt; and the amount known from the contraction. A quantity of air, sufficient for the combustion if the gas consisted entirely of methane, is then added. The gas-pipette having been filled with water, the gaseous mixture is drawn into it in the usual way, after closing the electric circuit. As soon as the level falls below the platinum spiral, combustion begins, and proceeds quietly and safely as the rest of the gas is drawn in. When completed, the gas is transferred to the burette, the carbonic anhydride absorbed, and the observed contraction divided by 3 gives the amount of the methane.

TESTING FURNACES AND CONDUCTING HEAT-EFFICIENCY EXPERIMENTS.

The following remarks from Herr O. Binder, who was for some time engaged in the Munich Laboratory for Conducting Experiments in Heating, may be of interest to our readers as illustrating German official methods.

The test of a furnace should include: (1) The chemical analysis of the fuel employed; (2) the examination of the chimney gas as regards chemical composition as well as temperature; and (3) the analysis of the ashes.

In sampling the fuel for analysis, when unloading a truckful of coal, every twentieth or thirtieth shovelful is thrown on one side. The heap thus obtained is reduced to pieces of about equal size, and spread out to form a square, across which two diagonals are drawn with a spade. Any two opposite triangles are taken for the sample, and treated in a similar manner; reducing in size whenever necessary, until the sample weighs about 10 kilos. It is then ground in a mill and sampled, in the same way, down to 200 or 300 grammes, which is ultimately finely pulverized. The moisture (hygroscopic water) is determined by ascertaining the loss from 2 grammes after exposure to 100° C. for two hours; a longer period may induce oxidation or decomposition. The coal should not be allowed to lie spread out before determining the moisture. For the estimation of carbon and hydrogen from 0·4 to 0·5 gramme is taken, and the combustion is conducted in oxygen under a small reduced pressure maintained by an aspirator. A layer of from 8 to 10 c. c. of asbestos well mixed with pulverized lead chromate is put in the front of the tube, to intercept the sulphur compounds; moreover, the tube is drawn out and connected directly by means of india-rubber tubing with the water-absorption-tube. When many samples of coal from the same source are being examined, it is only necessary to do the carbon and hydrogen in two of the samples, as these constituents do not vary much in coals of the same origin. The composition of the other samples may be calculated from their percentage of water and ash. For calculating the heating power in heat-units, Dulong's formula is used, as follows:—

$$8000 \times C + 29{,}000 \left(H - \frac{8}{O}\right) + 2500\,S - 600\,W,$$

where 1 kilo. of the fuel contains C kilos. of carbon, H kilos. of hydrogen, S kilos. of sulphur, O kilos. of oxygen, W kilos. of hygroscopic water, and A kilos. of ash.

The smoke is examined in a suitable apparatus (Bunte's burette, &c.) with the usual precautions as regards temperature, &c. The combustible gases are, of course, most important, and they must not be looked upon as present in inconsiderable quantities unless the sum of the percentages of oxygen and carbonic anhydride amounts to about 20·69—that is, the percentage of oxygen in the air. Of course, some oxygen is used up by the hydrogen, and some in the formation of the ash, and should be taken into consideration. The place for sampling the chimney gases should be carefully selected where the gases are well mixed, and before they have undergone cooling. The gases are drawn out through wrought-iron tubes, or if at very high temperatures, through platinum ones; the position when the sample is taken; the condition of the dampers, and the temperature being noted at the time of taking the sample. When possible, temperatures are taken by thrusting an ordinary mercurial thermometer into the chimney space when sampling. The thermometer is enclosed in a brass case with an opening round the bulb; but if great changes of temperature are expected, the bulb is protected with asbestos—dipping the thermometer into a tube of paraffin suspended on the flue being regarded as untrustworthy. For temperatures above the range of ordinary thermometers, a Steinle and Hartung graphite pyrometer is used.

The ashes are sampled in the same way as the coal, and are either submitted to a complete analysis or simply to a determination of ash. In the latter case, loss on ignition is reckoned as carbon.

In conclusion, it is pointed out that a report on a fuel, founded on mere analytical data, may not represent its full value, inasmuch as the fuel may frequently be much better utilized, and so become more valuable, by making a slight alteration in the furnace; and as points of this kind could only be decided by some one of experience, it is considered that men of this type only should be consulted in such matters. With regard to doubts cast on the chemical examination of a fuel, the author states that many fuels are so irregular in composition as to make it impossible to get an average sample; and in such cases he suggests that a chemical examination of the chimney gas is of primary importance in deciding the value of the fuel.

THE CALORIFIC VALUE OF GASEOUS FUEL.

In a recent number of the *Journal für Gas Beleuchtung*, Herr Schilling published the results of some investigations made by him into the calorific value of the various kinds of gaseous fuel which are now attracting the attention of power-users. Seven different gases were tested—viz. (1) Coal gas, from the Munich Gas-Works, (2) Siemens producer gas, (3) Siemens water gas, (4) Do., with or without excess of aqueous vapour, (5) Dowson gas, (6) Water gas, (7) Siemens and water gas mixed in the proportions of 80 and 20 per cent. The experiments carried out by Herr Schilling were most exhaustive; and their results are summarized in the following tables (the various gases being indicated by numbers corresponding with those given above):—

Percentage Composition of the Gases by Volume.

	CO_2.	CO.	H.	CH_4.	C_nH_m.	N.
No. 1	1·6	9·6	49·6	30·7	4·7	3·8
„ 2	4·5	25·7	..	..	..	69·8
„ 3	8·8	23·2	12·7	..	..	55·3
„ 4	14·2	16·0	19·9	..	..	49·9
„ 5	6·0	23·0	17·0	2.0	..	52·0
„ 6	2·7	43·8	49·2	0·3	..	4·0
„ 7	2·2	30·8	11·2	..	..	55·8

Calorific Value per Cubic Metre in Calories.

	CO.	H.	C_2H_4.	Carburets.	Total.
No. 1	289	1316	2604	1170	5379
„ 2	773	..	..	..	773
„ 3	689	337	..	..	1026
„ 4	481	528	..	..	1009
„ 5	692	451	170	..	1313
„ 6	1316	1305	263	..	2884
„ 7	926	297	..	..	1223

In calculating the heat of combustion of the hydrogen and its combinations, the water was considered as being in a vaporous, and not in a liquid state. It will be seen from the foregoing figures, that coal gas possesses about twice the calorific value of water gas, and four times that of Dowson gas; and they appear to confirm the results of certain experiments made in this country with the two gases employed as motive power, where the latter gas was shown to be 20 per cent. less valuable than the former for engine-driving purposes. The question of the employment of one or the other combustible turns, therefore, solely on the cost; and consequently the further cheapening of its production is the end to which the efforts of the suppliers of coal gas should be constantly directed.

WATER GAS AS BOILER FUEL.

Some interesting figures as to the value of both crude and carburetted water gas, as compared with coal, for fuel under steam-boilers, appear in the Transactions of the American Institute of Mining Engineers for 1888. The composition as deduced from numerous analyses is given as follows:—

——	Uncarburetted Water Gas.		Calorific Power per lb.	Carburetted Water Gas.		Calorific Power per lb.
	Volume.	Weight.		Volume.	Weight.	
Nitrogen	4·69	9·03	..	2·5	3·84	..
Carbonic acid	3·47	10·47	..	0·3	0·72	..
Ethylene	..	..	..	12·5	19·35	3896·1
Oxygen	..	..	..	0·2	0·34	..
Benzole	..	..	..	1·5	6·58	1174·3
Carbonic oxide	36·80	70·89	3116·3	29·0	44·66	1963·3
Marsh gas	2·16	2·39	576·1	24·0	21·23	4584·2
Hydrogen	52·88	7·22	3740·2	30·0	3·28	1699·2
			7372·6			13.317·1

Some experiments were made as to the heating power of the

gas, before and after carburetting, by the evaporation of water from an open vessel. A Bunsen burner was used for the carburetted and an Argand for the crude gas. The calorific power thus developed was 283 units for the crude, and 640·5 for the carburetted gas, results which were much less favourable to the latter than the calculation above given. A pound of good Lackawanna coal has a calorific power of 13,000 heat units; the quantities of gas required to give a corresponding amount of heat are as follows:—

	Ton of 2000 lbs.		Ton of 2240 lbs.
Crude	91,780	..	102,794 cubic feet.
Carburetted	40,590	..	45,564 ,, ,,

It will be observed that there is a defect in this comparison. The heating power of gas as ascertained by experiment, is compared with the full theoretical value of the coal. It is scarcely to be expected that the experiment with the open vessel utilized the full heating value of the gas. So far as may be judged by an approximate calculation, however, the practical result given for the uncarburetted gas agrees fairly well with that shown by calculation; but that for the carburetted gas is considerably lower, perhaps some 25 per cent.

In addition to actual saving in cost, there is an economy in firemen's wages. One fireman can attend to more than seven times as much horse power with gaseous firing, as he can with coal firing. The author adds 2s. 1d. per ton of coal on this account; and then arrives at the following as representing the equivalent value of gas for different values of coal:—

Coal at per Ton.	Equivalent Price of Gas, at per 1000 cubic feet.			
	Without Difference of Firing Cost.		Including Difference in Firing Cost.	
	Carburetted.	Crude.	Carburetted.	Crude.
s. d.	d.	d.	d.	d.
28 0	8·3	3.6	9·0	4·0
23 4	6·9	3·0	7·6	3·6
18 8	5·6	2·4	6·2	3·1
14 0	4·2	1·8	4·8	2·6
9 4	2·8	1·2	3·4	2·1
4 8	1·4	0·6	2·1	1·6

From this the author concludes that, under present conditions of manufacture, it would not be economical to employ water gas as fuel on a large scale. These figures, as we have observed, are based on the assumption that 13,000 units of heat could be practically utilized by the evaporation of water in a boiler. The author refers to a consumption of 4 lbs. of coal per horse power per hour, which represents a much smaller proportion of heat as practically utilized from the coal. It is known that gaseous fuel presents the advantage of yielding a much better duty in practice than solid fuel; and this point should have been considered in the calculation. After a liberal allowance on this head, however, it is evident that carburetted gas must be supplied for considerably less than 1s., and crude gas for half that price, in order to compete with coal at 18s. per ton.

For ordinary household purposes, where there is an intermittent demand for supplies of heat on the small scale, the wasteful way in which coal is generally applied, might render water gas more economical, even if purchased at a cost considerably higher than that above indicated. Another interesting point is that the proportionate cost of the crude and carburetted gas is less than the proportionate heating value; showing that under many circumstances it would be more economical to use the latter as a heating agent than the former. Or, in other words, that the water gas might be made a medium for utilizing petroleum as fuel.

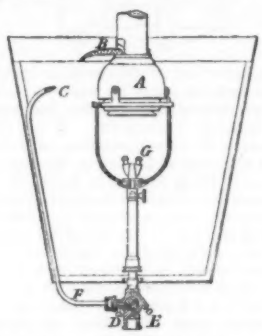
Smuggling Saccharine.—The manufacture of saccharine or coal-tar sugar, recently established in this part of the country, says the Düsseldorf correspondent of *Industries*, has been seriously checked in its development by the high import duties that have been imposed by our neighbours to protect their home sugar industry. These high duties have, it appears, led to smuggling on a large scale; for we are informed from Antwerp that several ships, ostensibly laden with oats, have arrived in that port, bringing saccharine concealed in the corn. The quantity may be calculated from the statement that the Customs have thus been defrauded of 400,000 frs.; the duty being 120 frs. per kilo.

The Dangers of Electric Lighting.—Last Wednesday, at the commencement of the performance of a Triumphal Ode at the Palais de l'Industrie, in the Champs Elysées, Paris, an electric lustre, not lighted, but ready to be started, suddenly burst into a blaze a few yards distant from the immense cloth awning which covers the whole nave. The orchestra stopped, and every one gazed with anxiety at the flames. At that moment there were upwards of 20,000 persons in the building. The correspondent of *The Times*, describing the scene, says: "Some women, in terror, rushed wildly towards the entrances; and a few men jumped over the barriers. The lustre was surrounded with wood; and if the fire had continued five minutes longer, no one can tell how frightful the result might have been." Fortunately, M. Alphand, the Director of Works, who had organized the *fête*, was present; and he ordered the burning lustre to be lowered, as it could not be put out. This was successfully done. At the same time the attendants and police prevented people rushing to the doors and causing a panic; and the alarm gradually subsided.

Register of Patents.

Lighting Apparatus for Gas-Lamps.—Barkowski, R., of Hammersmith, and Andrews, C. J. D., of the Schülke Gas-Lamp Company, of Queen Victoria Street, London. No. 14,047; Sept. 29, 1888. [8d.]

This invention relates to the lighting of regenerative gas and other lamps which are surrounded by a closed case. It consists in so constructing the lamp that it can be externally lighted with an ordinary torch; thus obviating the use of an auxiliary light, and preventing the necessity of removing the glass. It is more especially applicable in the case of regenerative lamps placed in street-lanterns, or where the lamp cannot easily be reached by hand.

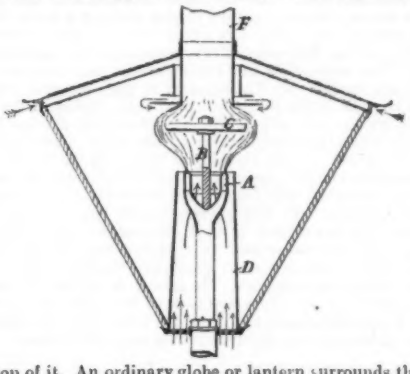


The illustration is a sectional elevation of a regenerative lamp mounted in a lantern (the upper part of the chimney not being shown). A is a casing, which covers in the body of the lamp; and therefore, when gas is turned on to the burners G, it passes upwards and into the lower part of the chimney. Here a hole about ¼ inch diameter is made in the side of the chimney; and above this hole is fastened a metal tongue B, slightly concave downwards, and perforated with holes to prevent any accumulation of soot from the flame issuing at the nozzle C of the pipe F. The gas from the lamp-burners issues from the small hole in the chimney, and accumulates under the tongue B in sufficient quantity to cause it to be ignited by the flame from C; and the gas, so ignited, flashes back to the burners G and lights them.

If a suitable quantity of gas passes through the burners, there is an absence of explosion; and the cock is therefore provided with two set-screws D and E, the former of which regulates the length of flame issuing at C, and the latter the quantity of gas passing through the burners at the moment of ignition. The cock is shown in the position when gas is flowing both through the pipe F and to the burners G.

Gas-Lamps.—Chandler, S., S., and J., of Kennington Oval. No. 14,177; Oct. 2, 1888. [6d.]

This invention, which relates to improvements in lamps or lanterns having Argand burners, consists in fixing a stud through the central orifice of the burner to support a ball or projection at a suitable distance



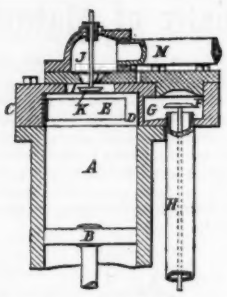
above the top of it. An ordinary globe or lantern surrounds the burner; and the top supports a coronet and dome, through which a funnel descends to within a short distance of the ball or projection.

In the accompanying vertical section of a lamp so constructed, A is an ordinary Argand burner, and B is the stud through the central air passage. C is the projection, which is shown as a disc, carried by the stud B at a distance above the top of the burner, but which may be of the form of a ball or of other suitable shape. F is the funnel, supported in the dome of the lantern, and descending to within a short distance of the disc. There is a reflector inside the lamp, with an air passage between it and the dome.

Gas-Engines.—Hearson, C. E., of Coburg Road, Old Kent Road, S.E. No. 14,401; Oct. 6, 1888. [8d.]

This invention refers to arrangements for effecting the charging of the cylinders of gas-engines with explosive mixtures, and the ejection of the spent or exploded charge therefrom in such a way that the mixture is caused to enter the cylinder of the engine in a tangential or approximately tangential direction, and after explosion is caused to pass from the cylinder at or near the axial portion of it.

In the illustration (showing a central longitudinal section of a portion of the cylinder of a gas-engine to which the improvements are applied), A is the cylinder of the engine; and B is the piston. C is a casting secured to the end of the cylinder farthest from the crank-shaft (in place of the ordinary cylinder cover), so as to constitute a cap to the end of the cylinder. In the side of the casting next the cylinder, a cavity is formed, in which is secured a hoop of sheet metal D, having an aperture

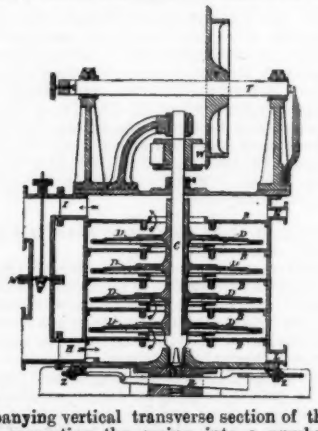


E formed in it. The inner face of this hoop is cylindrical, and of the same diameter as the cylinder; and its inner face virtually forms an extension of the inner face of the cylinder, but both the cavity and hoop are beyond the traverse of the piston. F is a chamber formed in a portion of the casting C, communicating with the interior of the cylinder by means of a passage G formed in the cap; the inner wall of a portion of the passage being formed by a portion of the hoop D, the aperture in which constitutes the inlet port of the cylinder. H is a pipe by which the explosive mixture is conveyed to the chamber F; and there is a valve on the end of the pipe. I is the outlet or exhaust port of the cylinder, by which the exploded gases escape therefrom into a box J secured over the port, which is provided with a valve K. L is the seating of the valve; and M is the exhaust-pipe by which the exploded gases passing into the box J from the cylinder are conveyed from the engine. The rods which carry the valves just mentioned are so connected with suitable moving parts of the engine as to cause them to open and close at the required times.

The sectional area of the passage G decreases towards, the inlet port; and the passage is approximately tangential to the cylindrical inner face of the hoop D, which constitutes the lining of the cavity in the cylindrical cap C; and which hoop (as already stated) also constitutes a prolongation of the cylinder, though the piston does not enter it. The effect of the contraction of the passage towards the inlet port, is to cause the explosive mixture to enter the cylinder at a high velocity; and the effect of the passage being formed in the direction stated, is to cause the mixture, on entering the cylinder, to whirl round within it, in contact with the walls thereof, and to approach the axial portion of the cylinder in a spiral direction, the part of the cylinder into which the mixture so entering last arrives being its axis. Consequently, the exploded gases with which the cylinder is filled prior to the entry of the mixture, are displaced by the incoming explosive mixture, and driven out through the exhaust port I; the dilution of the charge of explosive mixture in the cylinder to an appreciable extent by the gases resulting from the explosion of the previous charge being thereby avoided.

MANUFACTURE OF GAS.—De Brouwer, J., of Bruges, Belgium. No. 14,510; Oct. 9, 1888. [8d.]

This invention relates to apparatus for use in the manufacture of illuminating or heating gas, which may be called a "compound turbine exhauster and scrubber." By its rapid rotation, and the centrifugal action thus set up, the gas is caused to pass through a series of drums or blowers, in contact, and intimately mixed with suitable liquids, whereby one or more of the following effects may, says the patentee, be produced:—(1) The exhausting and forcing of the gas; thus replacing the exhausters now in use. (2) The removal of tarry vapours and of other fluids that the gas holds in suspension; thus replacing the apparatus now used to produce this effect. (3) The cooling of the gas by its contact with the liquids injected, if these liquids are of a temperature lower than that of the gas; or the warming of the gas if the liquids are hotter. (4) The absorption of the vapours and crystals of naphthalene, if tar or heavy oils are injected. (5) The carburation of the gas, if volatile hydrocarbons are injected. (6) The purification of the gas from its ammoniacal vapours (or impurities), if weak ammoniacal liquor or pure water is injected. (7) The absorption of carbonic acid, sulpho-hydric acid, and divers other impurities, if purifying liquids—such as caustic ammoniacal liquor—are injected. In fact, it is claimed to be possible, "by the rational use of this apparatus, to effect all the operations to which gas is actually submitted, from the time of its production in the retort to its discharge into the distributing-mains or holder."



In the accompanying vertical transverse section of the apparatus, B are diaphragms separating the casing into a number of chambers. They fit tightly against the casing, but are open at the centre, and have a flange round the opening, so that the diaphragms will form trays. H is the inlet-pipe, fixed below the lowest diaphragm, for the gas coming from the hydraulic main; and I, the outlet for the gas after it has passed through the machine. This is above the upper diaphragm. K is an inlet-pipe for liquids intended to be used in the purification of the gas. It is placed above the upper plate; and other pipes can be put in at other suitable parts of the apparatus. L is the outlet-pipe for the used liquids. C is a vertical shaft, which turns in a step-bearing in the bottom of the casing, and projects upwards through the cover to a bracket secured to the cover. This shaft is caused to rotate by any suitable gearing. D are a number of horizontal drums fixed on the shaft C, and each of these acts as a blower. It consists of a slightly conical or concave cast-iron disc, having a central hub, by which it is secured on the spindle, and a thin circular metal plate open in the centre, and having round the edge of the opening an iron ring, which will fit exactly the opening of the diaphragms B. There are a number of small pipes (cylindrical or conical), through which the water or liquids collected on these plates can flow on to the drums below. Annular deflectors are arranged to prevent the liquids passing away under the centrifugal action; and they also serve to guide the liquids to the holes by which they pass into the drums. In addition to the above essential features of the apparatus, a compensating or regulating arrangement M N is provided, of any convenient form, and a suitable gearing for the turbine T, V, W. The step-bearing (which consists of a plug moveable in a cast-iron socket) is raised or lowered by the aid of the right and left hand screws Z and Z^1, so as to adjust the shaft or spindle C, with the drums D in the exact position—so that the edge of the plate of the drums should come close to the edge of the diaphragms B; and thus prevent the gas from flowing back to the drum from which it has just been expelled. The space left above the drums, and under the upper diaphragm of the chamber, is sufficient to allow the gas to pass freely over it, and to flow in at the opening of the next drum in the series.

The action of the apparatus is as follows:—The shaft or spindle C, with its drums D, is caused to rotate by the gearing T, V, W from the prime mover, at convenient speed; and the pipes H, I, K, L being connected to the gas-mains, pumps, or reservoirs, as the case may be, the impure gas is drawn in at H. It immediately enters the drum, which forces it through the openings into the second compartment of the casing. From there the gas, being prevented from returning to the same drum, travels upwards to the opening of the next drum and so on, until it reaches the upper chamber above, and the outlet I. At the same time, water or other suitable liquid is run into the casing at K. It is collected on the top diaphragm or tray; flows down the pipes on to the centre part of the drum, and the centrifugal action immediately scatters it, mixes it with the gas coming into the drum from below, and forces the mixed fluids out together against the casing. The liquids descend by gravitation, and collect on the successive plates or diaphragms, from which they flow on to and through the drums below, until they reach the outlet L.

The effects of the apparatus on the gas and the liquids are multiple. They can, says the patentee, be ranged under three heads—viz., mechanical, physical, and chemical effects. (1) As mechanical effects, there is first the exhaustion and driving under pressure of the gas (or air). Each drum or blower has a propelling power proportionate to its speed, and to the quantity of liquids that pass through it; the total propelling power of the compound turbine being in proportion to the number of the drums of which it is made up. Another mechanical effect produced by the violent contact of the gas with the walls of the drums and of the casing, and also with the liquid, is the removal of the tarry and other condensable vapours contained in the unpurified gas. (2) The physical effects are: (*a*) the cooling of the gas, if cold water is made to meet warm gas, or the reverse, if cold gas is made to meet warm liquids; (*b*) the evaporation or distillation of volatile constituents of the liquids; (*c*) the saturation of the liquids with condensable gases or vapours. (3) As chemical effects, various reactions take place according to the nature of the liquids and gases under treatment; but it must suffice to mention the possibility of depriving the gas of its acid compounds by scrubbing in the turbine with caustic alkaline liquids, such as caustic ammoniacal liquor.

GAS ENGINES.—Crossley, F. W., Holt, H. P., and Anderson, F. H., of Openshaw, near Manchester. No. 14,248; Oct. 3, 1888. [8d.]

The object of this invention is to connect together the sliding cams which work the exhaust-valve, the gas-valve, and the ignition-valve, or the sliding rollers which bear against these cams, so that, in starting a gas-engine, when the exhaust-valve is opened to relieve the pressure in the cylinder, the gas-valve is opened independently of the governor; and the opening of the ignition-valve is somewhat delayed. The result is to provide further security against premature ignition during starting.

Fig. 1.

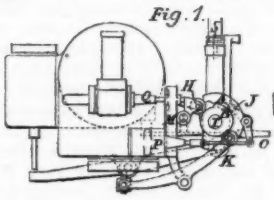


Fig. 2.

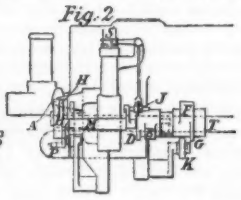


Fig. 3.

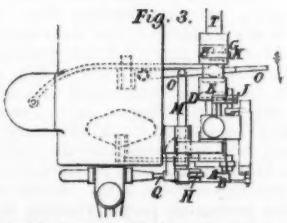


Fig. 1 is a part end view; fig. 2, a part side view; and fig. 3, a part

plan, showing the valve gear of a gas motor engine to which this invention is applied.

The governor moves a narrow roller J to the one side or the other of a narrow cam D; so that when the engine goes too fast, or does not go at all, the roller J is not moved by the cam D, and therefore the gas-valve P is not opened. The exhaust-cam F, the cam G for relieving pressure in starting the engine, the gas-cam D, and the additional gas-cam E, for opening the gas-valve at starting the engine, are all fixed on one sleeve, which can be slid along the lateral counter-shaft T by the handle O. This handle is connected to the weigh-shaft M, on which is fixed the lever carrying the ignition-roller H; so that the roller partakes of the same sliding motion as the exhaust-cams F and G and gas-cams D and E. In the ordinary working of the engine, the ignition-roller H bears against the cam A; the exhaust-valve roller K bears against the cam F; and the gas-roller J bears against the narrow cam-piece D. But the roller J is moved out of the range of the cam-piece D when the governor sleeve S is either raised or lowered by the governor; this raising or lowering being effected when the engine moves too quickly or too slowly.

At starting the engine, the governor sleeve S is down; and the roller J is consequently out of the plane of the gas-cam D. The handle O, being then moved in the direction of the arrow, brings the ignition-roller H opposite to the cam B, which is arranged to give a little later opening to the ignition-valve Q. At the same time the exhaust-cams F and G and the gas-cams D and E are moved so as to bring the cam G, for relieving pressure at the starting of the engine, into the plane of the exhaust-roller K, and the additional gas-cam E into the plane of the gas-roller J. The gas-roller is thus in position to be worked by the additional gas-cam E; and it can only be moved out of range of the cam E when the governor sleeve S is raised, or when the cams are moved back by the handle O to their normal position, when the gas-cam D comes into action.

APPLICATIONS FOR LETTERS PATENT.

13,631.—Noyes, P., "Automatic gas pressure attachment to be applied to various kinds of governors or regulators that are now in use." Aug. 29.

13,763.—Tatham, E., "An improved gas, usable as an explosive and, in admixture with other gases, as an illuminating and heating gas." Aug. 30.

13,971.—Clarke, C. L., Briggs, A. B., and Macpherson, R., "Improvements in apparatus for automatically lighting gas." Sept. 5.

13,999.—Brown, O., "Improvements in the manufacture of gas adapted for use in motor engines and otherwise, and in apparatus applicable for employment in such manufacture." A communication from G. A. Goyder. Sept. 5.

14,031.—Loves, J., "Improvements in apparatus for carburetting gas or air." Sept. 5.

14,060.—Mackay, F. N., "Improvements in separating tar and ammonia from gases, and in apparatus therefor." Sept. 6.

14,090.—Pitt, S., "Improvements in incandescent gas-burners." A communication from C. B. Harris. Sept. 6.

14,091.—Harris, C. B., "Improvements in incandescent gas-burners." Sept. 6.

14,128.—Turley, A., "The manufacture of carbon from town and other refuse, and the purification of sewage and other foul waters." Sept. 7.

14,149.—Thompson, W. P., "Improvements in or appertaining to regenerative gas-lamps." A communication from F. Stellwag. Sept. 7.

Brighton and Hove Gas Company.—The half-yearly meeting of this Company was held on the 6th inst., at the London Offices, Great Winchester Street, when the Directors' report (an abstract of which was given in the Journal for the 20th ult.) was adopted, and the dividends recommended—at the rates of 11, 8, and 6 per cent. per annum on the various classes of stock—were declared.

The Bristol United Gas Company and their Workmen—Many of the men employed at the three stations of the Bristol Gas Company have joined the Gas Workers' Union; and last week they sent in a requisition to the Directors asking for an advance of wages to the extent of about 10 per cent. The Directors will meet early this week, when the matter will be discussed in detail. So far the men have shown no disposition to strike, and are quietly attending to their work as usual.

The Gomersal Gas Company and the Lighting of Birkenshaw.—A public meeting was held at Birkenshaw last Wednesday, for the purpose of considering whether the Local Board should accept an offer from the Gomersal Gas Company to light the public lamps in the district at a charge of 3s. 3d. per 1000 cubic feet of gas. The Gomersal Gas Company last year offered to supply gas to the lamps at 3s. per 1000 feet; but that price was considered excessive. At a public meeting of ratepayers, it was decided to refuse the offer; and the lamps consequently remained unlighted during the whole of the winter. The action of the Company in raising the price 3d. per 1000 feet when approached by a deputation from the Local Board was adversely commented upon at the meeting last Wednesday; and the result of an animated discussion was that the terms were rejected, and the village will remain in darkness.

Electric v. Gas Lighting at Barnsley.—At the meeting of the Barnsley Town Council last Tuesday, the Town Clerk stated that he had received notices from three companies who intend applying to the Board of Trade for power to supply the electric light in the borough; and he read a letter from the Solicitors of the National Electric Supply Company (one of the companies in question) setting forth their intentions, and asking if the Council themselves purposed applying for authority in respect of electric lighting. If they did not, and had no objections to the Company putting down a permanent plant, they would be willing to provide for from 3000 to 6000 lamps as an experiment, and would be glad to supply the public with lights at per lamp or by meter. A motion was submitted to refer the matter to the Lighting Committee to inquire into the scheme; but an amendment was brought forward to instruct the Town Clerk to inform the Company that the Council will not offer any opposition to their application, subject to such arrangements as would be made with the Lighting Committee. This, however, did not find a seconder; and the motion was adopted. The Barnsley Gas Company have lately given notice of their intention to increase the price of gas by 4d. per 1000 cubic feet as from the 1st prox.; and the fact was commented upon by the mover of the resolution (Mr. Alderman Wood).

Correspondence.

[*We are not responsible for the opinions expressed by Correspondents.*]

THE DOCK LABOURERS' STRIKE AND THE GAS SUPPLY OF LONDON.

Sir,—You must allow me, in all fair play, to demur to the contrast you draw in your article in to-day's issue on the dock strike and the gas supply, between the attitude you assume that I have taken and that taken by Mr. Phillips.

I am not prepared to object to Mr. Phillips's letter to *The Times*, pointing out the difficulty the strike had placed some of his Company's works in. My view throughout has been that, while it would be most lamentable for the supply of gas to, and the safety of any part of London to be jeopardized, nevertheless if it should so come about by the wrong-headedness of those connected with the strike, that, after the fair and liberal way the Gas Companies have dealt with their own men, it would have the effect of damaging the movement in the eyes of the public and the authorities; and the Companies and their officers would be entirely cleared of responsibility.

Pardon my submitting that, in the face of a crisis which all must consider very grave, it is undesirable to suggest a division of opinion, or to reflect on the independent action of a capable and conscientious administrator dealing with exceptional difficulties. I cannot in silence allow my name to be used for the purpose.

Commercial Gas-Works, Stepney, E., Sept. 11, 1889. H. E. Jones.

THE PRICE OF GAS-METERS.

Sir,—I am informed that a number of the gas-meter makers have entered into an agreement to charge their various customers in accordance with the terms of the following table:—

Class.	Discount on Dry Meters.
Corporations and gas companies in towns of over 150,000 inhabitants. [List of towns given.]	25 % and 2½ %
Gas companies and corporations, factors, and gas-fitters in towns of over 80,000 inhabitants, and all railway companies. [List of towns given.]	20 % and 2½ %
Shippers, for export at any port	20 % and 7½ %
Corporations and gas companies, factors, and gas-fitters in towns below 80,000 inhabitants, and to all consumers in large or small towns	15 % and 2½ %

Wet meters 10 per cent. extra off the list.

It seems difficult to believe that such an unfair classification has been adopted by the majority of the meter makers; and, if I am wrongly informed, I invite correction from (say) Messrs. Parkinson, T. Glover, G. Glover, W. and B. Cowan, or the Gas-Meter Company.

I trust gas managers will carefully examine the tariff given above, and also express their opinion thereon. I will therefore only remark that it seems monstrous to me that ordinary consumers should be able to get a meter on the same terms as my company, who may buy a hundred or two in the year; and that railway companies and gas-fitters in towns of large size should be able to make their purchases at 5 per cent. less cost than I can, simply because I am the gas manager in a town of

Sept. 11, 1889. Under 80,000.

P.S.—I have just seen a letter from one of the firms mentioned above, offering one of my consumers a single dry meter at list price less 17½ per cent. discount. I will give the name if required.

OUTSIDE STOPCOCKS AND WATER-WASTE DETECTORS.

Sir,—I am obliged to Messrs. J. Tylor and Sons for their letter in your issue for the 3rd inst., corroborating my remarks that the automatic meter does not indicate where leakages occur. This has to be traced by the usual method with the sounding-rod by night; and I contend that, to detect leaks, outside stopcocks are necessary. I admit that a certain amount of leakage may be stopped without them; but no engineer would be guilty of sending men round from house to house by day to ascertain if there was waste of water, when he might readily discover in which house the waste was occurring.

Of course, the portable meter connecting a pair of hydrants will answer the same purpose as the expensive automatic meters fixed in every district. But this portable meter requires a watchman by night to protect it; and it may as well be dropped in a pit prepared for it, which pit would be useful when the meter is employed for testing a district again and again. I can fix an ordinary meter in the same way, and read it when I start my round, or at 2 and 4 a.m. I can go over my district in one night, and attend to the meter reading, which will inform me of the quantity of water taken, and the waste or use from 2 to 4 o'clock. I do not require tapes, or diagrams, or expensive clockwork plant. I know from my district inferential meter (if I think it necessary to use one temporarily) how much water is supplied to the district; I also know the number of inhabitants, and that the consumption of water is equal to 17 gallons per head. I cannot see how I am to be benefited in my night labour, or how the consumption of 17 gallons per head is to be reduced, as I am certain there is not the slightest leakage on any of the services or mains. This fact is ascertained by the same method as the waste-meter advocates employ; and it is in all points exactly similar to that which was introduced, if I recollect rightly, by Mr. Wilson, of the Liverpool Water Company, and also used by the Glenfield Company, before tape recorders and diagrams were invented.

Sept. 10, 1889. Another Night Inspector.

Proposed Electric Lighting in the Kingston-on-Thames District.—A conference of delegates of various local bodies in the neighbourhood of Kingston-on-Thames was recently held in the Town Hall, Kingston, at which a resolution was passed suggesting that the authorities represented should combine for the purpose of making an application for a Provisional Order to supply their districts with electricity, on the understading thatn no district is to be called upon to take a supply until it sees fit. The expense of obtaining the Order is to be defrayed by the combined districts in proportion to their several rateable values on the 1st of January next.

Legal Intelligence.

SUPREME COURT OF NEW ZEALAND.—Monday, July 15.

(*Before Mr. Justice* Williams.)

SCHMIDT *v.* THE DUNEDIN CITY CORPORATION.

ALLEGED INJURY BY THE EMISSION OF SULPHURETTED HYDROGEN FROM GAS-WORKS.

In this action the plaintiff claimed £200 damages for injury alleged to have been caused to his dwelling-house by the escape of sulphuretted hydrogen from the gas-works belonging to the defendants. The statement of claim set forth that the works were contiguous to the plaintiff's house; that on and since Jan. 31 last, and for a considerable period prior thereto, defendants negligently and improperly carried on the works, and by reason thereof "large quantities of offensive, poisonous, and unwholesome smoke, vapours, gases, sulphuretted hydrogen, and noxious matters have been wrongfully emitted;" that defendants wrongfully caused or permitted the manufacture at the works of chemical manures, and particularly of sulphate of ammonia, and permitted large quantities of offensive and noxious matters to be emitted therefrom; that, assuming defendants' right to carry on such manufactures, they had been guilty of negligent and improper acts and omissions in carrying out the manufacture; that the chimney for the discharge of smoke and other fumes was too low and inadequate; and that no proper contrivance was provided for the consumption of smoke or other fumes, or for their purification or destruction. By reason of these acts, the plaintiff averred that he had sustained damage to his house and fixtures, and the health of his family had been injured. He claimed £200 damages, and asked that the defendants be restrained from the carrying on of their manufactures in such a way as to cause a nuisance and damage. The defendants, in the course of their statement of defence, denied that they exercised exclusive control over the whole of the premises known as the gas-works. They denied that since Jan. 31 last, and for a considerable period prior thereto, they had negligently and improperly carried on, managed, and controlled the gas-works, and that by reason thereof large quantities of offensive smoke, fumes, sulphuretted hydrogen, and noxious matters had been wrongfully emitted from the works. They denied that they had wrongfully caused or permitted to be carried on at the works the manufacture of chemical manures and particularly of sulphate of ammonia. They denied injury to the plaintiff's property. And for a separate defence they said that on Nov. 1, 1888, they handed over to Kempthorne, Prosser, and Co.'s New Zealand Drug Company the sulphate of ammonia works that caused the alleged injuries, and gave them exclusive control over and possession thereof for a term of years; and if anything that had since been done had created a nuisance, or caused injury to plaintiff, it had arisen from causes beyond defendants' control, and in premises not under their control, and to which they had no access.

Mr. Hosking and Mr. Solomon appeared for the plaintiff; Mr. F. R. Chapman for the defendants.

Mr. Solomon, in opening the case, submitted that the points the plaintiff was called upon to prove, in order to establish his case, were: (1) The existence of a nuisance; (2) that the nuisance came from the defendants' premises; (3) the cause of the nuisance; (4) negligence; and (5) damage. On the first point, a nuisance had been defined as the repeated doing of something which was offensive in its nature and injurious to health, or which caused material injury or annoyance to a man in the enjoyment of his property. He contended that this was a private, not a public nuisance, in the sense that the nuisance had not been caused to the whole neighbourhood, but to a few people in the vicinity of the gas-works. In addition to its characteristic of an unsavoury smell, sulphuretted hydrogen was an actively dangerous gas. It was a narcotic poison, and was positively injurious to health, particularly to the health of children. With regard to the origin of the nuisance, general evidence would be given that the gas-works were the only place in the neighbourhood that the nuisance could come from; but there were, in addition, traces on the outer walls of the gas-works of the generation of sulphuretted hydrogen. With regard to the point of negligence, it would be given in evidence that with proper appliances there need be no escape of sulphuretted hydrogen; and there was also undoubted evidence that the gas-works could be carried on without any nuisance to the neighbourhood, because in 1884, after judgment had been recovered against the Corporation in the Resident Magistrate's Court for damage, the nuisance ceased, and did not re-appear until 1886. On the question of damages, the principal claim was on the ground of personal inconvenience; but he submitted that the case was not one where actual damages only should be given against the Corporation, but exemplary damages also.

Mr. *Johannes Schmidt*, the plaintiff, deposed that he lived in Braemar Street, South Dunedin. There was a street between his house and the gas-works. He had a wife and a family of three young children. The houses in the neighbourhood had first to complain in 1884 of a very peculiar smell. He placed the matter in Mr. Solomon's hands, several other people joining with witness. An action was brought, in which a Mr. Davidson was the plaintiff. They received compensation; and the nuisance ceased for a considerable time after the action, but occurred again in 1886, the same as before. An application was made to the Corporation then; but witness did not join in it, as his house was not as yet damaged. The nuisance was stopped again for a considerable time, but once more occurred in 1887, when witness recovered judgment for £9 or £10 in the Resident Magistrate's Court. The house was discoloured on that occasion, and he had it repainted. It was proved at the trial then that the nuisance came from the works. The nuisance was stopped until the winter of last year, when his house was blackened; and he made application to the Corporation for compensation. The Corporation then painted his house for him—in October. Directly after this the smell was ten times worse than it had ever been before. The sulphate of ammonia was said to be manufactured in a red-brick building at the works. There was an iron pipe, out of which the smoke from this building escaped. It was about the time operations began to be carried on there—at the end of October—that the smell re-appeared in strong form. It produced a sort of choking sensation; and, while it was occurring, witness and his family were troubled with diarrhœa, and at night he could not sleep. The roof of the house was of galvanized iron, which was not discoloured. The spouting was of painted galvanized iron, and it was not discoloured on this last occasion, though it had been at times previously. The wall paper in the passage, and in the rooms, and everything that was metal in the house was also discoloured. Witness wrote to the Gas Committee on Jan. 30, while the last smells were going on, asking that his house be renovated, and that steps be taken to put a stop to the nuisance. If anything at all the nuisance became worse; but it stopped within a day or two after the service of a writ in the case. In November of last year witness signed a petition to the South Dunedin Borough Council as to the nuisance. Before the manufacture of sulphate began at the gas-works, witness spoke to Mr. Graham, the Gas Engineer, on the subject; and the answer he obtained was that the stink would be ten times worse than before. Witness tried to sell his house, but could not get a price for it. He left it for a while to get out of the stench; but finding that he could not let the house, he had to return to it.

In cross-examination witness stated that there were six or seven houses in Braemar Street, opposite the gas-works. These houses were seldom vacant, but the occupiers were principally the owners. Apart from what he had mentioned his family had had fairly good health.

A number of witnesses were then called, who all deposed to offensive smells proceeding from the works, and gave evidence as to the effect of the smoke upon the buildings in the locality, and upon themselves.

Tuesday, July 16.

This morning further evidence was given on behalf of the plaintiff, the first witness being Mr. M. Sullivan, the Mayor of South Dunedin, who stated that he remembered a petition being sent to him in November last. In January he visited the works, and noticed a very bad smell, and a dense volume of smoke issuing from the funnel of the chemical-works. With other gentlemen, he afterwards visited the latter works, but found no stench; and as far as he could understand, the works appeared to be in good condition. The Mayor of Caversham (Mr. J. F. M'Laren) gave evidence to the effect that he formed one of the party who visited the chemical works in January or February. He was in the habit of passing the works; and the smell was something horrible. Other evidence of a similar nature was given; and then a number of expert witnesses were called.

Mr. *E. H. Hill* deposed that he had about 20 years' experience in chemical analysis. In February last, he examined the houses of Mr. Schmidt and Mr. Gordon, which were situated near the gas-works, and found the outsides very much discoloured. He took some of the deposit from the walls of Mr. Schmidt's house, and analyzed it to see what it consisted of. In the case of Mr. Gordon's house, he found sulphuretted hydrogen, lead, iron, alumina, manganese, and zinc. The alumina was in small quantities, and might have come from the evaporating-basin. In the case of Mr. Schmidt's house, he found the same except the zinc, which was not present in traceable quantities. He did not make a quantitative analysis, but there appeared principally to be lead sulphide. Sulphuretted hydrogen would produce lead sulphide upon action with oxide of lead or carbonate of lead. Ordinary house paint would contain carbonate of lead, so that sulphuretted hydrogen acting upon it would produce sulphide of lead. Having given evidence of the discolouration of articles inside the house, he stated that ammoniacal liquor, if exposed to the air, would give off sulphuretted hydrogen. Supposing steam were passed through ammoniacal liquor in a Coffey still and sulphuric acid were applied, sulphuretted hydrogen would be given off in large quantities. Taking it on the basis of sulphate of ammonia, every 115 lbs. of sulphate of ammonia that was made would evolve 34 lbs of sulphuretted hydrogen. From the proximity of the houses to the gas-works and the sulphate-works, witness concluded that the sulphuretted hydrogen came from them. As compared with air, the specific gravity of sulphuretted hydrogen was 17 to 14. The effect upon the paint of the buildings must have been produced by pretty large quantities of sulphuretted hydrogen. The description, that had been given of the smell was borne out by chemical knowledge. He described the methods usually employed in gas-works for getting rid of sulphuretted hydrogen. As to the ammoniacal liquor, the plan generally adopted was to convey it to a less thickly inhabited place, and there make sulphate of ammonia from it. The Dunedin Corporation ran it into the harbour.

Cross-examined: Witness made a complete qualitative analysis of the paint from Schmidt's house. There was a slight residue of carbon which he took to come from the oil. Traces of sulphuretted hydrogen would be caused by burning coal in the house. Ammoniacal liquor contained carbonate of ammonia, sulphide, sulphate, and other substances. Carbonate and sulphate were, comparatively speaking, in small quantities; but the proportions depended very much upon the kind of coal dealt with. In the analysis of the paint he procured from the house, he took no percentages; but sulphide of lead was the principal compound he found. He examined some red paint taken from the wall of the sulphate building facing Braemar Street. He found iron and sulphuretted hydrogen with a slight trace, as he thought, of lead. He only had 3 or 4 grains to treat with. The reaction for lead was slight, if there was one. If the paint was made of red lead and hematite, he would have discovered more lead than he did.

Professor *J. G. Black* gave evidence of a similar nature to the preceding witness. He said that he had not the slightest doubt that the sulphide of ammonium or the sulphuretted hydrogen came from the gas-works. A small quantity of the gas in a long time, or a strong quantity in a short time, might have caused the results he saw. He did not think that the burning of household coal would have caused the deposit he saw. All the authorities said that sulphuretted hydrogen was a narcotic poison. It was consistent with its character that it should make people vomit. It was a recognized part of the process of making gas that provision should be secured for removing sulphuretted hydrogen. The Gas Companies in London were compelled to remove every trace of the sulphur from the gas before delivering it to the consumer; and lime was the principal agent employed for this purpose. Supposing reasonable precautions were taken, he did not think that more than traces of sulphuretted hydrogen need escape. As a chemist, he would say that ammoniacal liquor should not be left exposed in the open air in the midst of a resident community. If ammoniacal liquor, containing a large proportion of sulphide of ammonium, were treated with sulphuric acid, it would evolve large quantities of sulphuretted hydrogen.

Cross-examined: Sulphuric acid had not in itself a very great effect upon metal articles; but when oxidized with sulphurous acid, there was a corroding effect. The best New Zealand coal did not give off more ammoniacal liquor than English or Australian coal; but he had found as much as 3 tons of sulphur in 100 tons of Greymouth coal, which was a large proportion.

Some medical gentlemen were then called, who testified to the effect sulphuretted hydrogen had upon persons who inhaled it. The symptoms were, it was stated, "a general feeling of insanition, nausea and vomiting, fulness of the head and giddiness, want of vigour, and occasionally diarrhœa."

This closed the case for the plaintiff.

Wednesday, July 17.

Mr. Chapman this morning opened the case on behalf of the Corporation. He said that the case made by the plaintiff, though it had taken two days, was really a comparatively small one. What the plaintiff said was shortly, that he had, on three or four several occasions, suffered injury from different causes, leading to the same result, so far as he was concerned. Though the plaintiff had been compensated four times—and for the purposes of this case, it must be considered that he had made a full complaint on each of these occasions—he had never up to this time made a complaint of injury to the health of himself and his family. The evidence had been directed to smells which apparently arose immediately upon the commencement of work in the particular department held by Messrs. Kempthorne, Prosser, and Co; and according to the evidence—

and the evidence was singularly unanimous on the subject—the smells ended exactly when the process was discontinued. He (Mr. Chapman) would call witnesses—and he could only call the evidence of those who were at the works—to show that the process which had been apparently condemned by Mr. Hill and Dr. Black had never been understood by those witnesses. He intended to prove in evidence that the City Corporation discontinued the manufacture of sulphate of ammonia in 1887; finding that it was not a paying process, although it had been a convenient means of getting rid of the residuals. In 1888, however, Messrs. Kempthorne, Prosser, and Co. asked that the matter might be put into their hands, and that they should pay a certain rent for the premises, and also pay for the privilege of drawing the ammoniacal liquor from the tank, and carrying on the process. The premises were shut off; and the only connections with the outside were a pipe direct to the Corporation liquor tank and a door opening into the street. The premises were not approached through the gas-works; and they were completely out of the control of the Gas Engineer. As to the legal aspect of this, it would be more convenient to address the Court when the evidence was closed.

Mr. *E. Turner* deposed that he was a manufacturing chemist, now in the employ of Messrs. Kempthorne, Prosser, and Co. He remembered when the Company commenced the manufacture of sulphate of ammonia at South Dunedin. He took charge of the establishment; and operations were begun in November. The premises consisted of a single room with brick walls all round and an iron roof, with an open archway in front facing the gas-works, and an open archway leading into the rest of the main building, which was now used as a pump-shed. The archway into the other part of the building was partitioned off by boards; and he had no access. When he took charge, he made a few alterations to the premises. A new chimney was erected, and carried 6 feet above the top of the old chimney; the entire length being 30 feet. He described the process of sulphate of ammonia manufacture, and then said that the second saturator or chamber which was underneath and at the back of the condenser, caught all the noxious gases, if any. This chamber contained a large amount of fresh lime puddle, which took up any persulphide of ammonia that came over, and all the sulphuretted hydrogen. The water that was used in the process, for cooling, ran down the main drain into the gas-works at the side facing Braemar Street. This waste water had not been the means of liberating sulphuretted hydrogen. Witness was perfectly satisfied that, in his process, the lime took up all the sulphuretted hydrogen. The spent lime, before being emptied, which was about once a month, was allowed to stand two or three days, and had more solution of lime added to it on the day it was taken out. The waste lime was buried in ashes, which remained on the works until they were removed, which was about once a fortnight. The spent lime was not strong of sulphuretted hydrogen, but was nearly all sulphur. There was no smell at all from the lime in the yard, as the ashes would absorb the little that would be attached to it. On the occasion when the Mayors of South Dunedin and Caversham visited the works, he made no special preparations. Witness had found his process effective in getting rid of the whole of the sulphuretted hydrogen. When the residents petitioned the Corporation on the subject of the alleged nuisance, members of the Corporation or any petitioners were invited to visit the premises, and inspect them for themselves. Witness had not suffered in health from his occupation. The waste water from the condenser, after the ammonia was run off, was carted away in the Corporation drain; but it contained no sulphuretted hydrogen. It would contain a little free ammonia, which, however, would not be detected by anyone passing. All that his men knew of sulphate manufacture was derived from what witness told them. The quantity of sulphuretted hydrogen in ammoniacal liquor depended upon how the gas was purified, and what coal was used. He knew it was a difficult matter to get rid of the sulphuretted hydrogen in purifying gas. There were not very large quantities of sulphuretted hydrogen generated when sulphuric acid was poured on to the vapour. The quantity generated in the saturator, if set free, would be sufficient to cause a nuisance if there was no purification. The nuisance would be such as had been described by the witnesses; and would be a dangerous nuisance. He made a ton of sulphate a week, but could have produced more. He diminished the quantity so that there might be no ground for complaint. The discolouration of the sulphate building he attributed to sulphuretted hydrogen, which arose from the manufacture of gas. The ordinary domestic coals in that country contained a large amount of sulphur. Witness had noticed the effect of this in the blackening of the roofs of houses.

Mr. *T. W. Kempthorne*, Managing Director of the New Zealand Drug Company, stated that he had frequently visited the works in question, and he never found any nuisance. He had recently seen the process of manufacturing sulphate at Auckland. About the same principle was adopted there as at Dunedin; and lime was the only purifier used.

Mr. *D. A. Graham* stated that he had occupied the position of Gas Engineer for the Corporation for six or seven years. When he took charge of the works, the ammoniacal liquor, which was very weak, passed away to the bay by a drain going through the works. Now it was taken to a large closed reservoir; holding about 200,000 gallons. No overflow was provided; and he had to get rid of the excess by pumping it, and sending it by a special pipe into the harbour. There were the ordinary gaseous and mixed smells about the works, such as were inseparable from the manufacture of gas; and there was in addition a most intolerable and unhealthy smell from the harbour. The strength of the ammonia was only 1½° Twaddel when witness took charge; but he altered the process, and the strength was increased from 3° to 4° Twaddel. He had to get rid of the ammoniacal liquor in some way; and for a time he let it run through the ditch. Part of the sulphuretted hydrogen was given off; and, diffusing with the air, the wind sent it against the houses. This, he thought, was how the damage was done in the first instance. In the third instance, a thing had occurred which had never occured to any great extent before or since. The lime from the purifier gave off some of the sulphuretted hydrogen; and the houses were damaged. The second occasion was a little before this. He had been collecting ammoniacal liquor in a large tank, with the view of commencing the manufacture of sulphate. A man who was working in the sulphate-house met with an accident which was so serious that witness had to look out for another man; and before he could start the new works, the tank got too full, and he had to discharge some of the strong ammoniacal water into the ditch, and damage was done in that way. These were the three occasions on which the matter went to Court. There was a complaint by Mr. Schmidt last winter, which was caused, witness fancied, by soot from the high chimney, or possibly by a little sulphuretted hydrogen that had not been burnt in the boiler. Schmidt's house was painted on that occasion under witness's instructions, zinc-white paint being used. Such paint was not liable to be damaged by sulphuretted hydrogen. The damage could not have been caused on this occasion by the escape of sulphuretted hydrogen from the tank at the gas-works. Witness had visited Schmidt's house shortly after this action was commenced. It was not very dirty; between the boarding there was a little accumulation of dirt, just the same as he had seen all over the other houses. He did not use in the Corporation sulphate of ammonia works the same process of purification as was used by Kempthorne, Prosser, and Co. There was nothing that he was aware of in the works under his charge to cause an unusually bad smell in the neighbourhood of Schmidt's house in November, December, and January last. The purifiers were emptied every ten days in summer, and every four days in winter. In his evidence Schmidt had said that he (witness) had told him the smell would be ten times worse when Kempthorne, Prosser, and Co. started their works. This statement was untrue.

THURSDAY, JULY 18.

Mr. *Graham* was this morning cross-examined, and he stated that if he did not use tar for his boilers, he would use coke only, and in that case no sulphuretted hydrogen could come from his chimney. He was compelled to use tar in order to force his boilers. His method of getting rid of the spent gases from the sulphate works was to pass them through a fire. He believed that in sulphate works lime alone would be sufficient to arrest the sulphuretted hydrogen. He did not admit that the sulphuretted hydrogen on the wall of the sulphate works came from the processes of manufacture carried on by him in the gas-works. Assuming that the deposit on the wall of the sulphate works was caused by sulphuretted hydrogen from the gas-works, he saw no reason to say that the deposit on Schmidt's house was not caused in the same way. Sulphuretted hydrogen from the ammonia works would seem to be the cause of the deposit on the wall of the sulphate works. On one or two occasions at most, witness had noticed a disagreeable smell, which appeared to be a smell of sulphuretted hydrogen, in the neighbourhood of Schmidt's house.

Evidence was then adduced which went to show that other residents in the locality had not complained of nuisance, and that they regarded the neighbourhood as being healthy.

Justice WILLIAMS said he was satisfied that there was abundant evidence to show that the damage was caused by the escape of fumes from Messrs. Kempthorne, Prosser, and Co.'s works, and not from the gas-works on this occasion, and that there was negligence; but whether the Corporation were liable for the doings of Messrs. Kempthorne, Prosser, and Co. was a matter of law.

Mr. HOSKING quoted authorities to show that where a landlord let premises in a ruinous condition—that was to say, in a condition that was likely to do harm—he was responsible, unless there was a covenant for repairs (and there was no such covenant in the deed between the Corporation and Messrs. Kempthorne and Co.); that the measure of damages was such amount as the jury might think would compel the defendant to abate the nuisance, and not the amount of the diminution of saleable value; and that persistence in a proved nuisance was justification for exemplary damages.

Mr. SOLOMON, following on the same side, argued that the liability of the Corporation was a two-fold liability. In the first place, they were liable because a nuisance arose from premises of which they were the owners; and in the second place, they were liable because they assisted in the commission of an act which was a nuisance, and they were joint tort-feasors with Messrs. Kempthorne, Prosser, and Co. Their liability under the second head might be further subdivided into their liability—(*a*) in their position as a statutory body, and (*b*) apart from that consideration.

FRIDAY, JULY 19.

Mr. CHAPMAN, addressed the Court on behalf of the defendants, and submitted that the fact of land being vested in a person or Corporation gave power to create a demise, though it might not give the power to create a term amounting to a long alienation of the land. Learned Counsel elaborated this point and cited numerous authorities in support of it.

Judgment was then reserved; and by the mail received yesterday we learn that on July 31 it was given for the plaintiff—damages, £25.

We shall complete our report next week.

GREENWICH POLICE COURT.—WEDNESDAY, SEPT. 11.

(Before Mr. KENNEDY.)

JOYCE *v.* HISCOCK—THREATENING A GAS COMPANY'S FOREMAN.

This was a charge brought against *Alfred Charles Hiscock*, aged 34, bricklayer, of threatening to assault Michael Joyce, a foreman at the East Greenwich works of the South Metropolitan Gas Company.

Mr. J. T. MOSS prosecuted on behalf of the Company; Mr. SCARD defended.

Mr. *J. Tysoe*, Engineer at the above-named works, said the prisoner had been in the employ of the Company there; Joyce being a foreman. Witness received the letter produced (understood to contain libellous statements), signed "A. C. Hiscock," and handed it to Joyce soon after it reached him. The prisoner left the Company's service in May last.

Michael Joyce, the prosecutor, said that the previous witness had given him the letter, which he took to the prisoner at his residence, saying, "I've come for an explanation of the letter you sent to Mr. Tysoe." Prisoner replied: "I did write the letter; and it was not half strong enough with you. Rather than work with you I would lie down in the street." Witness said he would look further into it, whereupon the prisoner replied: "Perhaps you may not live to do so, for I'll blow your brains out," at the same time placing his hand behind him as if to produce a revolver. Witness then walked away. While the prisoner was in the employ of the Company, witness had occasion to complain of his manner of doing his work. He did not see a pistol in the prisoner's possession, but believed he had one.

Mr. SCARD said he could prove that the prisoner had no pistol in his possession.

Mr. KENNEDY said he did not think much of the matter of the pistol.

Mr. SCARD said his client would promise not to repeat the threats.

Mr. KENNEDY said this would answer the purpose. He bound over the prisoner to keep the peace; ordering him to find one surety in £10.

INCREASE IN THE PETROLEUM TRADE IN LIVERPOOL.—An important question came before the Mersey Docks and Harbour Board at their weekly meeting last Thursday week, in the form of a recommendation of the Works Committee that the Board should erect on the Parkhill Estate, at the south end of the dock system, six large petroleum depots, with all the requisite conveniences, including pipes to connect the depots with the Herculaneum Branch Dock. The estimated cost of the work is £30,000. Mr. Brancker, Chairman of the Committee, referred to the enormous increase which has taken place in the petroleum trade in Liverpool during the past few years; and said that, as greater facilities were urgently required for the conveyance of the oil from the steamers to the tanks on shore, the Committee had brought forward a comprehensive scheme. In accordance with the Standing Orders of the Board, the recommendation was formally postponed until the next weekly meeting, when it was adopted. When the depots are completed, there will be storeage for 19,000 tons of petroleum. Each tank and installation will be isolated from its neighbour by a moat and earthen embankment, to minimize the risk of accident.

Miscellaneous News.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Albion Tavern, Aldersgate Street, E.C.—Mr. FREDERIC LANE LINGING in the chair.

The CHIEF CLERK (Mr. W. J. Arliss)—in the absence of the Secretary, Mr. Magnus Ohren, who was confined to his bed—read the notice convening the meeting; and it was afterwards agreed to take as read the Directors' report and the accounts for the half year ending June 30 last. These statements were summarized in the JOURNAL for the 3rd inst. (p. 462).

The CHAIRMAN said, in moving—"That the report of the Directors and the balance-sheet, examined and signed by the Auditors, be received, adopted, and entered upon the minutes," he could do so under an un-interrupted progress of the affairs of the Company; for their onward progress had been maintained during the past half year in a very satisfactory manner. They had sold 5,741,000 cubic feet of gas in excess of the quantity consumed in the corresponding period of 1888, or an increase of rather more than 1¼ per cent.—really 1·62 per cent. This was rather below the average, and he attributed it to some extent to the lightness of the weather during the last three months of the half year, compared to the dark days that were experienced during the latter part of the half year ending June, 1888. Their financial position was a very healthy one. The Directors were enabled to pay the dividends on the respective capitals, and carry forward the sum of £3419 to the present half-year's accounts; and they had a floating balance—of course including that sum—of £13,000 to meet any contingency that might arise. They had, as would be seen by the report, announced a reduction in the price of gas to 2s. 6d. per 1000 cubic feet, to take effect from the close of the present quarter; and they had done so with confidence, although perhaps it might be said that the even tenour of their way had been a little interrupted in the early spring of the year by the agitation that took place on the part of the pitmen at the various collieries, resulting in a very liberal increase of wages to them, and he might say, as a matter of course, an increase in the price of coal. As far as the Company were concerned, it was not a very serious matter. They had to place against this extra cost 9d. per ton off coal dues, which would go a long way to neutralize the extra cost of coal. In addition to this 9d., they had 4d. per ton more looming in the future—at no distant period—to the Company's advantage. This 4d. was taken by the Corporation of London under an Act passed in the session of Parliament just closed. Besides this rise in the price of coal, there was another matter to which he must allude; and that was the further charge, under the head of wages, to be brought against revenue, in consequence of the concession that they had made to the workmen in time and labour. He might say that the Directors felt confident that these additional charges would be met out of the ordinary revenue of the Company half year by half year; but should it be necessary for them to fall back upon the floating capital, of course they would do so. It was for that purpose; and they would be applying it to its legitimate use, and it was perfectly ample. They had, like most other gas companies been extremely anxious to do all they could to increase the consumption of gas; and, as a means to that end, they had had lectures on cooking by gas in different parts of their district, and he thought he might say they had been fairly satisfactory. If they took the months of May, June, and July of 1888, and contrasted them with those months of the current year, they found in the latter period that they had fixed 100 more cooking stoves than in the first-named period. He took the months of May, June, and July, because they happened to be the period of the year when most gas-stoves were generally fixed; and they were the months this year when the lectures were given. He considered that they might fairly credit the lectures with a good deal of their success. It had been the good fortune of those who had occupied the chair on previous occasions to announce to their brother-shareholders almost an uninterrupted prosperity of the affairs of the Company; but he thought it only right to state that this prosperity had, there was no doubt, arisen from the low price of coal on an average over a long period; and in addition to this other commodities connected with the manufacture of gas had been singularly low. They had therefore been able to reduce the price of gas very rapidly, until now they had brought it down to 2s. 6d. per 1000 cubic feet, which, the Directors thought, must satisfy the consumers of a suburban district; and he believed it would enable them to successfully compete with any other form of light that might be introduced into the area over which they had control. As to the reductions that had taken place, it would be remembered that the price was lowered at Michaelmas of last year, and at Lady-day of this year, and now at Michaelmas (at the close of the current quarter) they were going to further reduce it. These three reductions meant a concession to the consumers of upwards of £9000 a year. He would not detain the proprietors unduly with the accounts, because there was nothing of very great importance that he required to refer to. In regard to coal, it had cost the Company £370 less than in the corresponding period of last year. About £100 less had been expended on purification; and meters and stores showed a decrease of £243. The works repairs—that was, keeping the plant in proper repair—exhibited an increase of £973. Of course, the proprietors were aware that over the renewals at the works, the Directors had no control. The plant must be kept in efficient order; and so in this particular half year, there was this addition of £973. The other items on the debit side were much about the same as in the June half of 1888; but on referring to the credit side of the account, it would be seen that there was a decrease in the gas-rental of £1192. Now this had arisen entirely from the reduction in the price; for in the first half of last year they were charging 2s. 9d. per 1000 cubic feet, and in the half year under consideration, the price had been 2s. 8d. and 2s. 7d. Respecting residuals, two of them had rather reversed. There was a large increase of tar, and coke exhibited a decrease. But, as was mentioned in the report, they had given up the use of tar for heating purposes. It was now more valuable to sell. The consequence was that they had received a higher price for it; and the accounts showed that compared with the corresponding six months of last year, there was an increase in the receipts for tar of £1287. As a reverse, coke showed a decrease of £464. But inasmuch as they did not use tar for fuel, of course it followed that they had to fall back on coke; and thus the decrease. The return from sulphate of ammonia had not been quite so good as in the corresponding period, but that really had arisen in consequence of the market not having been so favourable; and so they had suffered. The quantity of coal carbonized in the half year was 38,080 tons, compared with 37,697 tons—being a decrease of 383 tons. The coal cost 4d. per ton less than in the first half of last year—13s. 7d. per ton, as against 13s. 11d. The amount of gas sold was 360,081,000 cubic feet compared with 354,340,000 feet, or an increase of 5,741,000 feet. The gas unaccounted for was in a healthy condition; standing at only 4 per cent. The capital was equally low; being only £4 15s. 8d. per ton of coal carbonized. In conclusion, the Chairman urged the shareholders to have faith in gas, and to have faith in their investments in the Company; for they might be assured that they stood upon a strong foundation. They could not, of course, always expect to travel in the same groove of prosperity. That was contrary to Nature; for in the life of man, in his worldly career, there must be sunshine and shade. So in concerns like gas companies, there must be changes; and if they could only get the sun to predominate a little over the shade, that, he thought, was as much as they ought to expect. Their Company, and gas companies generally, had been singularly fortunate—they had been very prosperous, and he saw no reason why their prosperity should not be maintained.

Mr. GEORGE LIVESEY said that the Chairman had dealt with the accounts so exhaustively, and in such an able manner, that there was nothing left for him to do but to second the motion, which he did with very great pleasure.

The resolution was unanimously agreed to.

The CHAIRMAN next proposed—"That a dividend for the half year ending June 30 last, be now declared at the following rates per annum—viz, 6 per cent. on the preference stock, 7 per cent. on the ordinary 7 per cent. stock, 10 per cent. on the ordinary 10 per cent. stock, and 7 per cent. on the new ordinary 7 per cent. shares, all less income-tax, and that the warrants for the net amount be forwarded by post, on or before the 20th inst., to the registered proprietors on the 30th of June last."

Mr. C. LEA WILSON seconded the motion, which was at once passed.

The CHAIRMAN said he now had the pleasureable duty to move that the salary of the Secretary be increased by £50 per annum. He (the Chairman) was sorry the Secretary was not present; but he was not very well. The shareholders all knew Mr. Ohren. He himself had worked with him for 30 years; and he could conscientiously say that a man more devoted to the Company's interests there could not be. He (the Chairman) had had occasion from time to time to speak of the officers, and therefore he would not detain the shareholders by making any unnecessary remarks. He was sure that they would fall in with his suggestion, and unanimously vote the £50 to the Secretary.

Mr. LIVESEY said it was his pleasure to second the proposition. He could thoroughly endorse all the Chairman had said in regard to Mr. Ohren; and he felt quite certain that the shareholders would take the same view. He thought he would be forgiven if he told the meeting that the Secretary was the only officer about whom they had to come to the shareholders in the matter of salary. All the other officers were servants of the Board, who made agreements with them direct; and he might say that the Engineer (Mr. C. Gandon) had already been dealt with by the Board. He mentioned his name because he felt that it was appropriate at this time to tell the shareholders that they had not only an admirable officer in Mr. Ohren but also in Mr. Gandon. There was a great responsibility at this period resting on the engineers of gas companies; and such a position was not a sinecure. He was happy to be able to say that Mr. Gandon had shown himself to be fully equal to fill the position in which he had found himself. He (Mr. Livesey) was referring more particularly to the question of labour. There had been a great agitation among the stokers; and Mr. Gandon had been able to retain his hold on the men. He (Mr. Livesey) believed it was the duty of gas companies to deal fairly and liberally with their workmen—even generously, he thought he ought to add. He did not say that they should pay them higher wages; but they should make the conditions of their employment rather better than they could get in ordinary outside firms. This had been done; and the result has been, that, even with all the difficulties that had arisen, Mr. Gandon had been able to meet the men, and do what was fair and right There was another point about which Mr. Gandon had had some trouble. There was a society known as the Gas Workers' Union; and the other day they sent in a notification by their Secretary (to the Directors) to say that, on and after Sept. 12, Rule 16 of their rule book would be enforced. This rule provided that no man was to be allowed to work in a gas-works unless he was a member of the Union. Mr. Gandon met this in a proper spirit, and told the Union that it would not be recognized, and would not be allowed to interfere in the Company's business; and Sept. 12—the fatal day—had passed quietly by. He might tell the men that the Directors were quite determined, while dealing fairly and liberally with them, to retain the management of the concern in their own hands. He had great pleasure in seconding the motion for the advance of Mr. Ohren's salary.

Mr. ENNIS said the Chairman had spoken of the Secretary in most generous terms; and Mr. Livesey had ably supported the motion. He was glad to hear the way in which the officers had been referred to, because he thought in the present day they held very responsible positions. It seemed to him, and he dare say it had occurred to other shareholders while listening to the magnanimous terms in which their old Secretary had been alluded to, that they were scarcely warranted by the amount of the sum which it was proposed to place at his disposition. He was adverse to moving anything in the nature of a hostile amendment; but he should like to see the sum extended to £100. Mr. Ohren was the General Manager of a Company—at all events theoretically the Chief Officer—with a capital of £400,000, and had been with them 30 years. He was not young in years; and the shareholders could not expect that they would be able to give him many further increases of his salary. He hoped that, under the circumstances, in moving an amendment that the sum be increased to £100, the Directors would not regard it as hostile, and that it would have the support of the shareholders generally, and also of the Chairman and Mr. Livesey. He proposed a resolution in accordance with his remarks.

Mr. BEETON seconded the amendment.

Mr. R. HESKETH JONES said he did not rise for the purpose of discussing whether the advance should be £50, £100, or £200. He thought the Directors were able to judge much better than the shareholders generally what the sum should be. He suggested that the amendment, having been proposed and seconded, should be withdrawn, and that the Board should reconsider the question, and bring it up again at the next half-yearly meeting.

The CHAIRMAN said that Mr. Jones's suggestion was a very practical one. The Board had taken the matter into consideration; and he could assure the shareholders that they felt just what they expressed—a most generous disposition towards their officers. He should be greatly obliged if they allowed the suggestion to pass, because he thought it better it should do so, especially as it came from a proprietor who was well versed in everything pertaining to gas.

Mr. ENNIS said he felt somewhat coerced; but in deference to the Chairman's appeal, he would withdraw the amendment with the concurrence of his seconder. He was, however, glad that he had placed it on record that the shareholders of the Company had every desire to be generous and liberal to their officers, especially under present circumstances—they were now getting full dividends, and were carrying forward a substantial amount.

Mr. A. G. HOUNSHAM asked whether the increase would date from the commencement of the current half year.

The Chairman replied in the affirmative.

The motion was then agreed to.

Mr. Gandon said it was an entirely new thing for either the Secretary or the Engineer to say anything at a meeting of the Company; but he asked the Chairman's permission before the proceedings began, if the proprietors acceded to the recommendation of the Directors, that he might be allowed to say a word or two in Mr. Ohren's absence. The shareholders all knew what a deep interest Mr. Ohren had ever taken in the affairs of the Company, and that he had always done his best to promote the interests of the concern. He felt very grieved that he was not able to be present at the meeting; and he asked him (Mr. Gandon), in the event of the motion being carried, to express his great sense of the kindness of the Directors and the shareholders in granting this increase in his remuneration.

Mr. Jones said he thought the shareholders must have been very gratified to receive the report and accounts for the past half year, added to which they had had a very lucid statement from the Chairman. As a shareholder and consumer, he was glad to see the price of gas down to 2s. 6d.; and he testified to the purity and quality of the gas. Referring again to the extra remuneration voted to Mr. Ohren, he said that Mr. Gandon would quite understand that what he said was not in the slightest degree to prevent the shareholders giving their Secretary an additional sum to that proposed by the Directors; but rather that the matter should be kept in proper order for the next meeting. He was sure that Mr. Ohren himself would prefer an increase on the carefully-considered recommendation of the Directors rather than on the spontaneous outburst of the shareholders, though he knew full well that all the shareholders recognized Mr. Ohren's valuable services. He (Mr. Jones) held that it was much better that things should be done in order at their meetings.

Mr. Ennis said that he believed his remarks were quite in order.

Mr. Jones (continuing) proposed that the thanks of the shareholders be given to the Directors for their services during the half year.

Mr. Ennis seconded the motion; and it was agreed to.

The Chairman briefly responded; and then moved a similar acknowledgment of the services of the Auditors (Messrs. A. T. Layton and C. Newton), the Secretary, the Engineer, and all the other members of the staff.

Dr. Hetley seconded the proposition, which was carried.

Mr. Layton having acknowledged the compliment,

A vote of thanks was passed to the Chairman for presiding, on the motion of Mr. Horatio Brothers, seconded by Mr. Archer.

The proceedings then terminated.

SHEFFIELD UNITED GASLIGHT COMPANY.

The Half-Yearly Report and Accounts.

The Directors of this Company will be able to congratulate the shareholders, at their meeting on the 1st prox., on the issue of the working of the concern during the half year ending June 30 last; an increase in the receipts being shown both from the sale of gas and residual products. From the former, £80,187 was received; and from the latter, £30,588. The other items of income also appear to be in a healthy condition. Meter and stove rental produced £4527; the profit of the fitting department was £834; the earnings of railway wagons amounted to £683; and the rents receivable are entered at £113. Added together these items total to £116,934. On the opposite side of the revenue account, we find that £69,858 was expended on the manufacture of gas. The disbursements under distribution required a sum of £5603; and rents, rates, and taxes absorbed £6094, of which £64 only was needed for rent. Management cost £4062; and an even £100 was all that was spent on "law." The bad debts stand at £232, which cannot be considered excessive for an undertaking of this magnitude. The sum carried to the profit and loss account is £35,982; and we see that with this amount there is a balance to the credit of that account available for division among the shareholders of £37,415. The reserve fund account amounts to £78,612. Respecting the capital account, there is a substantial balance in hand of £21,641. The aggregate receipts on this account are £665,009; the expenditure to June 30 amounting to £643,368. In the half year £8841 was expended, less £799 depreciation on meters and stoves. Of the £8841, manufacturing plant, &c., is debited with £5908; distribution, with £2007; and new meters and cooking-stoves, with £925. The Directors, in their report recommend the maximum dividends as follows:—On £135,000 class "A" stock, £6750; on £209,053 class "B" stock, £10,452 18s.; on £229,070 class "C" stock, £11,354 10s.; on 11,462 "E" shares of £8 10s. each (£6 per share paid up), being 6s. per share, £3438 12s.; on 19,262 "D" shares of £6 each (24s. per share paid up), being 1s. 2½d. per share, £1155 14s.—total, £33,250 9s. There will thus be above £4000 to carry to the current half-year's accounts. The Board are intending to apply to the Board of Trade for a Provisional Order to enable them to utilize as part of the Company's Neepsend station about 5 acres of land, a portion of which was purchased this year.

ST. ANDREWS GAS COMPANY.

The Annual General Meeting of this Company was held last Friday, when the Manager (Mr. J. Hall) reported that the total income of the Company from all sources for the year ending the 31st ult. had been £4046, and the total expenses £2712; leaving a balance of £1334. The income from residual products had been £372—an increase of £64 over last year; and for the next two years a favourable and increased price had been obtained for the surplus tar and ammoniacal liquor. This, with a small outlay at the works, would increase the income from tar and liquor from £227 to more than £400 for the year. The balance at the credit of the Company was £2201, to meet the payment of a dividend of 50s. per share, and £200 towards reducing the debt of the Company, which at present is £700. These two payments would leave a balance of £349 wherewith to carry on the works. Last year the price of gas was reduced from 3s. 9d. to 3s. 7d. per 1000 cubic feet; and the Directors recommended that it should be further reduced to 3s. 6d. The Manager stated that, as meters were not charged for, this would practically bring the price down to 3s. 3½d. The report alluded to the fact that Mr. Paterson and others had raised a note of suspension and interdict in the Court of Session for access to the Company's books and list of shareholders (see *ante*, p. 259). Lord Wellwood, it may be remembered, decided the case in Mr. Paterson's favour; but he has not up to the present time made any application for exhibition of the books of the Company. The report further stated that at a special assembly of the shareholders held on the 27th of March last, it was unanimously agreed by the meeting, representing 266 shares out of a possible 395, to call upon Mr. Paterson to resign his office as a Director of the Company, as his actions had been and were at variance with its interests. The letter to Mr. Paterson intimating this resolution had not been acknowledged, and he had not attended any meeting of Directors since the 5th of March. The Chairman (Mr. J. Ritchie Welch) moved the adoption of the report; remarking that they had had one of the most prosperous years the Company had enjoyed since its establishment, upwards of 50 years ago. He was sure the shareholders would all agree with him that they were largely indebted for this to the excellent management of Mr. Hall. Mr. Howie seconded the motion, and it was carried unanimously. Mr. Purvis moved a resolution approving of the action of the Directors regarding the litigation, and empowering them to pay out of the Company's funds the expenses connected therewith. This was agreed to; and it was also decided to give Mr. Hall an *honorarium* for his efficient services.

COLONIAL GAS UNDERTAKINGS.

Particulars have reached us of the working of the following Colonial gas undertakings in the six months ending June 30 last.

The profit realized by the Australian Gaslight Company in the above-named period amounted to £47,914; and the Directors recommended the declaration of a dividend of 7½ per cent., absorbing £46,429, and leaving a balance of £1415. The Engineer (Mr. T. J. Bush) reports that the whole of the Company's plant has been kept in a thoroughly efficient condition.

The Maryborough Gas and Coke Company, Limited, had at the close of the first half of the year a sum of £1644 standing at the credit of the profit and loss account. This the Directors recommended should be disposed of as follows:—Dividend at the rate of 10 per cent. per annum, £1250; to the reserve fund, £100; and to the retort-benches account, £200—leaving £94 to be carried forward. Early in March last the new retorts, gas-engine, and exhauster were brought into operation with satisfactory results. During the half year considerable additions were made to the mains and services, under the supervision of the Company's Engineer (Mr. J. Henderson, C.E., M.S.E.); but owing to continued depression in trade, an increased consumption of gas had not followed at the time the report was issued.

The seventh half-yearly report of the Armidale Gas Company, Limited (of which Mr. Samuel Rutter is Secretary and Engineer), shows a profit of £374, which with a balance of £12 brought forward, made up a sum of £386 available for distribution among the proprietors. The Directors recommended a dividend at the rate of 8 per cent. per annum, absorbing £320; an addition of £50 to the reserve fund; and leaving £16 to be carried forward.

THE BRISTOL CORPORATION AND ELECTRIC LIGHTING.

The report of Mr. W. H. Preece on the lighting of Bristol by electricity has been printed, and issued to the members of the Electrical Committee of the Town Council; and they have met and considered the matter. It is understood that applications have been received from several electric lighting companies who are willing either to undertake the work themselves, or carry it out under the Corporation; and, as it was considered that there was no time to be lost if the Corporation were to take action in the matter, the Committee have requested Mr. Preece to prepare specifications upon which the Corporation would be enabled to advertise for tenders. The matter will then be submitted to the Town Council for their consideration. In regard to the report, after setting out that electric lighting has reached its practical stage, and referring to the various systems introduced, Mr. Preece proceeds to state his opinion that the proper system to introduce into Bristol is the alternate current transformer system. He estimates, from the population and from the consumption of gas in Bristol, that they ought to be prepared to supply 70,000 lamps. It might, he says, be several years before the whole of this installation would be required; but it was necessary to look forward eventually to supplying electrical energy for such a number, and this would mean an eventual capital of £300,000, or thereabouts. The alternate current system being elastic in character, a commencement might be made with a capital of £30,000; and by laying down plant for the supply of 5000 lamps, additions might be made as the system grew. The central station could be erected anywhere within the limits of the city, but by preference it should be near the water, or where coals were cheap. Mr. Preece is of opinion the time has come when every town must take into consideration the introduction of electric lighting; and he points out that so strong is the feeling, that Major Marindin has contended that the Board of Trade would be justified in over-ruling the decision of any local authority who objected to the introduction of electric lighting into their midst simply from obstructive reasons or from prejudice, and who did not intend to carry it out themselves. The Corporation had to regard electric lighting from two points—viz., the illumination of the public streets and the supply of electricity for private lighting purposes. Mr. Preece admits that the cost of public lighting by electricity will certainly be more than by gas. But he thinks the very much enhanced illumination will amply repay the extra expenditure; while, as regards private lighting, he states that it is as beneficial as any act of sanitation which has been adopted by local authorities. The Corporation had, therefore, to look boldly in the face the subject of the mode of introducing the electric light into Bristol; and the question for their most careful consideration was whether they should do it themselves or whether they should allocate the right to do so to some private company. Three modes of operation are referred to in Mr. Preece's report—first, the carrying out of the conditions of the Provisional Order by the Corporation; secondly, the invitation of tenders from substantial companies to supply the current in Bristol under such conditions as the City of London has adopted, and under the powers of the revised Order; and, thirdly, to leave the field open to some commercial company to obtain the requisite rights and privileges. Enumerating the reasons in favour of the Corporation carrying the thing out themselves, Mr. Preece estimates that the profits derived from private lighting would pay the cost of public lighting, and the Corporation would retain for itself the control of the whole system. But, on the other hand, the Corporation would be entering into a competitive business with an existing commercial interest. At present the only Corporation that has undertaken the work of electric lighting is Bradford. The whole question was one of a purely commercial character, and must be controlled by local conditions and facts. Electric lighting was, however, perfectly practicable; and his view was that it was the light of the future, while he did not anticipate it would do harm to gas, the future of which was the supply of fuel and heat.

Northallerton Water Supply.—The Northallerton Local Board have decided to construct a compensation reservoir to hold a seven days' supply of water (4,200,000 gallons), and to allow the mill-owners to draw a maximum of 67,000 gallons per day therefrom.

Prospective Increase in the Price of Gas at Stourton.—A rumour is current that the price of gas in the Stourton district of the Rothwell parish is about to be advanced 8d. per 1000 cubic feet. The Leeds Corporation supply the gas to this hamlet; and, in consequence of the unusually low figure charged hitherto, and the rise in the price of coals, it is said the advance must be made.

Lewes Gas Company.—At the meeting of this Company yesterday week, it was reported by the Directors that there was a profit on the half-year's transactions of £1390. After paying the interest on mortgages, the balance of net revenue was £1762. It appeared from the Chairman's (Mr. Alderman Kemp's) remarks that, to pay a 5 per cent. dividend, the undivided balance had to be encroached upon to the extent of £25.

WARRINGTON CORPORATION GAS SUPPLY.

The Disposal of the Profits.

In the JOURNAL last week we briefly noticed the result of the discussion in the Warrington Town Council, on the 3rd inst., on the recommendation of the Gas Committee to transfer from the profits of the gas undertaking the sum of £1000 to the reserve fund, and a similar amount to the borough fund, and on the long counter-proposition brought forward (unsuccessfully, as the event showed) by Mr. Voisey. It may be of interest to give to-day some of the remarks made by the speakers on the occasion.

Alderman HOLMES, Chairman of the Gas Committee, explained that they had power to establish a reserve fund amounting in all to £10,000. They had already set aside £2500; and, in addition to £1000 which it was proposed to add to that amount, they were going to give £1000 to the ratepayers. It was, he contended, a serious thing to tamper with their income. The Committee would never think of making a reduction in the price of gas of less than 2d. per 1000 cubic feet; and even this meant a lowering of their income by no less a sum than £1300 for the year. They could not afford this; and had therefore decided to place in the hands of the ratepayers £1000, which, coupled with the reduction the Committee made, of upwards of £700 a year in the price of the street-lamps, would make an equivalent to the ratepayers of rather more than £1700. This amount would be rather over 3d. in the pound in aid of the rates. They could not afford to trifle with the income, because they had three large items of expenditure. The first was the erection of two new gasholders in place of two old ones. They cost about £1250; and as there would be some additional expenditure, £1300 was the lowest figure which could be put down for them. They had also the new sulphate plant, which had to be paid for out of the income of the gas undertaking for the past year. They were further painfully aware that the price of coal had gone up considerably; and for the current year the additional expense would probably be something like £1000. The two reductions already made in the price of gas represented a sum of £20,917 19s.; while with regard to the consumers outside, the amount was £1464 18s. 9d. The ratepayers had received a benefit to the extent thus named. The report of the Gas Engineer, he thought, reflected great credit on Mr. Haddock's management. He moved the adoption of the Committee's recommendations.

Mr. VOISEY proceeded to move the resolution of which he had given notice (*ante*, p. 512), and explained that his object was to give finality to the question of gas profits. The proposal of the Committee was good as far as it went; but they appeared to have begun at the wrong end, and were merely nibbling at the question. They did not tell the Council whence the £2000 came, and why they proposed to deal with it in the way named. He contended that it was the duty of the Committee to tell them what profits they had made, and what they proposed to do with them altogether. In the motion which stood in his name, he took the responsibility of stating that the Committee had made an ascertained profit of £23,559 4s. 5½d., after providing for the sinking fund liability. He put his finger on the assets representing these profits, and asked the Committee to dispose of them in the way he had suggested in his motion. In his report there was only one item to which anyone could take exception—viz., that which he said represented an expenditure of £13,010 11s. 1d. on capital account out of revenue. It was truly capital expenditure, for the reason that the Gas Committee had all along treated it as such, after, they must assume, careful consideration. It was for new mains, meters, &c. The Committee had no doubt acted for the best, and spent the money well and prudently; but, having parted with it, it was not to be made available to be handed over to the Borough Treasurer, or invested as a reserve fund. But there was the large sum of £4350 unborrowed on the authorized loan of £47,000; and the least the Committee could do was to get in all that money, and make it available as far as it would go. They could bring in another figure of £10,548 13s. 4½d., which was an asset, but which existed as money, or as an equivalent for money. If they utilized these they would have the large figure of £14,898 13s. 4½d. to dispose of. He asked them to declare that of this amount the sum of £10,000 should be treated as a reserve fund, that the difference of £4898 13s. 4½d. be paid to the Borough Treasurer in aid of the borough fund, and that for the present there be no separate or special investment of the reserve fund of £10,000, but that the same remain sunk in the general assets, since without it the Committee would not have sufficient funds wherewith to work the gas undertaking. He did not think they should remain in the position in which the Committee left them that night, and take £1000 on account of the reserve fund and £1000 on account of the rates. They did not know anything about the profits, and they knew nothing about their real circumstances. This was the nature of the first section of his motion. The proposal he made under the second section (B) was more difficult to carry out, but it suggested again a serious matter. The Gas Committee had parted with profits to the amount of £13,010 11s. 1d. during the past twelve years, and in such a manner that they could not be recovered. They should have known what moneys they were spending, and have asked the Council for its approval of the expenditure in that shape. If section B could not be discussed, certainly there could be no objection to take to section C, which went on to say that the available profits to be declared, less the above, were £13,010 11s. 1d.; leaving a difference of £10,548 13s. 4½d., to be applied thus: Invest as a reserve fund £5000, and pay to the borough fund in three even annual instalments, payable on the 1st of March in each year of the next successive three years, £5548 13s. 4½d. If the Council did not settle the matter, it was for the ratepayers to decide whether they had not a right to go to the Local Government Board thereon, although he was not going to ask them to do so. He concluded by proposing, as an amendment, that sections A and C of his motion be adopted instead of the resolution of the Gas Committee.

Alderman BURGESS seconded the amendment, for the sake of discussion.

Alderman DAVIES, in the course of a long speech, said the Council would find that in March last the cost of the gas-works was given as £199,886 14s. 10d.; but when it appeared in the annual accounts it was altered to £198,999 15s.—showing a difference of £886 19s. 10d. Again, in the annual accounts it was stated that the surplus profit disposable under section 43 of the Act which authorized the purchase of the gas-works was £24,218 10s. 5½d.; but according to the notice of motion given that evening it was reduced to £23,559 4s. 3½d.—making a difference of £659 6s. However, this matter was only by the way. He should keep to the figures as they appeared in the published accounts. He would have a plain tale to tell which would put down the "gush" of figures which the Council had before them. The trade profits from June, 1877, to March 25, 1889, including bank interest and rent, were £135,597 5s. 11½d. To come off this were parliamentary and law expenses, £3066 13s. 4d.; total annuities paid during the same period, £57,962 7s.; and interest on loans, £22,566 15s. 2d. These three items came to £83,595 15s. 6d., which deducted from £135,597 5s. 11½d. left a balance of £52,001 10s. 5½d. It had been suggested that the Committee should add to this sum the amount gained by the Corporation through the Borough Treasurer purchasing annuities at less than 25 years' purchase, which came to £1075 4s.; also the premiums gained by taking up capital loans—the sum received on this account being £703. The total of £1778 4s. should, it had been suggested, be taken as a profit made by the Gas Committee; so that the whole total would be £53,779 14s. 5½d. In the first place, the two sums making up the £1778 4s. were in no way profits of the Gas Department, but money made by the Corporation on account of its good credit, and through the ability of the Borough Treasurer. A sum of £11,983 0s. 3d. had been improperly transferred from charges against revenue to capital, with the view of increasing the apparent profit of the Committee. When talking of this item, it must be borne in mind that the gas-works were a depreciable property, and especially in the face of electric lighting; but gas-works were always a depreciable property. However, the fact was that the works had not depreciated to the extent of a penny since the Corporation bought them. The next item he had to call attention to was the sinking fund. They were obliged to pay, or set aside, each year for the purpose of eventually paying off the cost of the gas-works, £2783. The present capital value of the annuities was put down at 25 years' purchase. But what was the result? An Act of Parliament might just as well be passed enabling them to give every man they met sixteen shillings for a sovereign; but they could not find the man. And so it was to-day. It was considered that 25 years' purchase was a more reasonable figure. The result was that instead of having £121,432 10s. as the capitalized value of these annuities, £136,004 8s. would be the figure; and the responsibilities of the Corporation in connection with the gas-works were that eventually they would have to pay this balance. The difference between the present value of the annuities and what they were taken at was £14,571 18s.—the remaining liability. Added to this was £2500 reserve, which by Act of Parliament the Corporation were bound to invest. They had no right for a moment to invest these moneys in working their concern; they should be invested separately. The first proposition of Mr. Voisey was *ultra vires;* and the other two were utterly impossible, because the Committee had not the money to carry out the proposals. Adding up all the items of which he had spoken, a total of £58,616 2s. 3d. was obtained, which, deducted from the £53,729 14s. 5½d., left a deficiency, instead of a surplus of £4836 7s. 9½d. In the face of these figures, the Council might ask how the Committee were enabled to put £1000 to the reserve fund this year, and set apart £1000 under section 43 of the Act. The fact was that they had an exceedingly good time last year, making altogether a profit of £4275 2s. 1d.; but how was this brought about? By the abnormally low price of coal. It cost 2d. per 1000 cubic feet of gas less than it had ever before been in the time of the Committee. The Committee would have little or no profit at the end of this year, for the reason that they had struck off two large sums—one of £709 for public lamps, and £1100 for expenditure in rebuilding and improving the sulphate plant at Longford. Not for a moment would he allow money like this to be spent out of capital; it must be paid out of revenue or not at all. He was told that the increased coal bills this year would be something like £1000. So the Council would see that, although the Committee made £4000 odd last year, they had items actually staring them in the face which would sweep away £4000 this year. He contended that by the purchase of the gas-works, the Corporation had benefited the consumers of gas to the extent of £20,918 by the reduction made in 1882-3 and 1884-5; that the ratepayers benefited to the amount of £709 per annum by the reduction in the charge for public lighting, besides getting the £1000 now to be paid to the borough fund; and, further, that the future ratepayer would have an advantage to the extent of £28,442, the amount invested in the sinking fund. This showed a benefit of £51,069 given to the town without costing the ratepayers a penny. So they must not go away with the impression that the purchase was a loss; it was a profit. He hoped for all time to come the capital account of the gas-works would be a closed account.

Mr. MONKS said Mr. Voisey knew very well that the Gas Committee had not at their disposal the money he would lead the Council to suppose. Since the Corporation took over the works, the production of gas there had increased from 102 to 179 million cubic feet; and anyone knew that a capital which was needed for working a business of 102 millions would be insufficient for one of 179 millions. With the prospect of dearer coal, it would not, in his opinion, be safe to adopt the policy suggested by Mr. Voisey. In 1884, the year before the reduction of 6d. per 1000 cubic feet was made, the profits amounted to £13,657. The two succeeding years they were £9078 and £9749; the two latter sums being far below the absolute necessities—an income of at least £10,600 a year being required. As a large consumer of gas he did not feel that he had to ask the Committee's further assistance at present. The time was coming when, out of the profits, something should be handed over year by year in aid of the rates; but he contended that up to the present time the Council were not in a position to ask for a penny.

Mr. VOISEY remarked that it was not a question of the future, but of the past profits. What had the Committee done with the £52,000 they had made?

Mr. MONKS admitted that the profits amounted to £52,000; but, as Alderman Davies had pointed out, the item of £1778 in connection with the annuities was outside the question. Out of the £52,000, a sum of £2500 had been added to the reserve fund. Then £11,983 had been what they called "capitalized," and £28,442 went to the sinking fund—leaving a balance of £9000 to be disposed of. If reference were made to the assets, it would be found that there were nearly £7000 in book debts; the stock was £3000 more; and the difference was in cash.

Mr. VOISEY asked if he understood Mr. Monks to admit that £13,733 had been spent out of the profits.

Mr. MONKS said he would admit, upon the authority of Mr. Paterson, that the amount had been capitalized; but if it were his own business he should write it off. He believed the soundest policy would have been to have put all the accumulated profits of the Gas Committee into the reserve fund until they had reached the sum of £10,000. Then the Committee would have been in a position to have contributed to the rates of the town according to the Act of Parliament. The whole thing came to this—that they had to meet an actual expenditure of £10,600 practically The average of the business for the last twelve years had been £12,000; and he considered that a margin of £1400 was little enough for the safe conduct of such a business as the gas-works.

Mr. H. ROBERTS congratulated Mr. Voisey on having been the means of eliciting such a statement with regard to the gas undertaking as they had never had before. He opposed the purchase of the gas-works, not on the ground that the town should not be the owner of its own property, but because he thought the price was in excess of their then value. It all showed the more strongly, after the careful dealing with the accumulated profits, that the capital sum should stand at an early date at as reduced a sum as possible; and if the Committee had spent £11,000 out of profits in making the concern a better profit-making industry, instead of charging this sum to capital, he considered their policy was a sound one. He had only one fault to find with the results. The Committee had given to the gas consumers a large sum of money, but they had presented very little indeed to the ratepayers. At as early a date as possible the Committee should consider how far they could benefit those ratepayers who did not consume gas.

Alderman CROSFIELD said he was one of those who opposed the purchase of the gas-works; and he still believed that the town would have been a great deal better off without them. He contended that the capital account should not be increased, because it was already so heavy that the consumers had not been able to have gas at as cheap a rate as they ought to have had it.¶

The MAYOR (Alderman Sutton): It is cheaper now than you have ever had it before.

Alderman CROSFIELD: It is not so cheap as it is in other towns, where the people are not so well situated as we are here.

The amendment was then put; but, as already stated, its mover was its only supporter, and the Committee's minutes were confirmed.

STOKE-UPON-TRENT CORPORATION GAS SUPPLY.

THE ACCOUNTS OF THE GAS UNDERTAKING.

We have received from Mr. Herman Taplay, the Gas Engineer and Manager of the Stoke-upon-Trent Corporation, a copy of the accounts of the gas undertaking for the year ending March 31 last. The gas-rental amounted to £9857; a sum of £2027 was received for public lighting; and the residuals returned £2339—the total receipts being £14,848. In the manufacture of gas, £3353 were expended for coal, £595 for salaries, and £2146 for wages—the total expenditure being £8463. The balance carried to the profit and loss account was therefore £6385, which added to the amount brought forward (£6906) made £13,291 at the credit of this account. On the expenditure side a sum of £2378 appears as interest upon loans, there is a repayment of £593 of the principal, and £2500 was paid over to the Corporation; the balance of £7794 (including the year's net profits, amounting to £3388) being carried forward. At the end of the accounts are some comparative statistics in regard to the working of the undertaking. In the year 1888-9, the quantity of gas made was 85,698,000 cubic feet, of which 80,373,300 cubic feet were sold; leaving 5,324,700 cubic feet, or 6·21 per cent., unaccounted for. In 1887-8 the figures were: Gas made, 83,513,000 cubic feet; sold, 77,734,000 cubic feet; unaccounted for, 5,779,000 cubic feet, or 6·92 per cent. In that year the coal cost on an average 7s. 3¾d. per ton; last year it came to 7s. 9½d. per ton. The gas and stove rents (meter-rents have not been charged since 1881) show an increase on the amounts received in 1887-8; and whereas the residuals returned in that year only 4s. 8½d. per ton of coal carbonized, last year they returned 5s. 5½d. There was also an increase of about £1800 in the net profit.

CARLISLE CORPORATION GAS AND WATER SUPPLY.

THE WORKING IN THE YEAR ENDING JUNE 30.

The Gas, Water, and Baths Committee of the Carlisle City Council have issued their report on the working of these departments of the Corporation during the year ending June 30 last, accompanied by the usual financial statements. We learn from the report that the consumption of gas for lighting, heating, and power continues to increase; the rate in the past year being 3·51 per cent. more than in the preceding twelve months. Notwithstanding the additional consumption, there is a falling off in the revenue from the sale of gas, caused by the reduction made in the price as from December last. An improvement has taken place in the value of residuals; and the Committee think it will probably continue for some time longer. It has been found necessary to extend the manufacturing and purifying plant at the gas-works; and these and other improvements will shortly be completed. Reference is made to the advance in the price of coals which has recently taken place; but the Committee express the hope that, with continued efficiency and economy in the management, and a maintenance of the higher prices derived from some of the residual products, it may be possible to keep the charge for gas at its present figure without any substantial decrease in the profits. A reduction in the price of water was made from December last; but the additional new consumers in the city and surrounding districts have slightly increased the revenue from water-rents for the year. The water-works (which, with the gas-works, are under the supervision of Mr. J. Hepworth, Assoc. M. Inst. C.E.) have been maintained in a satisfactory condition; and a reduction has been effected in the working expenses by the continued efforts which have been made to curtail the waste of water. The profits derived from these two undertakings in the past financial year were as follows:—Gas, £7596; Water, £4758—total, £12,354.

The accounts accompanying the report show that the sale of gas produced £21,600; the rental of meters, £659; and residuals, £4698—the rents and the fittings and meter accounts making up a total of £27,587. The manufacture of gas cost £16,678 (coals figuring for £9719, repairs for £3966, and wages for £2265); its distribution entailed an outlay of £964; the lighting and repair of the public lamps cost £559; rent, rates, and taxes came to £998; and management to £719—the total expenditure being £19,991. The balance carried to the profit and loss account was £7596; which added to the amount brought forward and the interest made £13,714 to the credit of the account at the close of the year. This sum is disposed of thus: City fund, £9066; income-tax, £112; interest on consumers' deposits, £90—total, £9268, leaving a balance of £4446.—— In the Water Department, the net amount of the water-rents accrued to the 30th of June last was £7004. The expenditure for maintenance, &c., came to £2002; and for management to £244—the amount carried to the profit and loss account being £4758. This sum added to the balance brought forward and the interest, made up a total of £11,450, which was thus disposed of: To the district fund, £4291; income-tax, £89—leaving a balance of £7070.

In the course of a report presented to the Committee by Mr. Hepworth, he gives the following figures showing the quantity of coal carbonized, and the gas made and accounted for, in the past as compared with the previous financial year:—

	1888.		1889.
Coal and cannel carbonized (tons) . . .	17,508	..	17,284
Gas made (cubic feet)	186,916,000	..	193,151,000
Gas accounted for (cubic feet)	179,371,750	..	185,662,200
Gas unaccounted for (cubic feet) . . .	7,544,250	..	7,489,000
Percentage unaccounted for	4·03	..	3·87

The quantity of gas made per ton of coal was 11,174 cubic feet, of which 10,613 cubic feet were sold. The illuminating power of the gas was 19·52 candles. Mr. Hepworth states that the use of gas for heating, cooking, and power purposes is being gradually extended, and promises to be a source of increase in the demand for gas for some time to come. With reference to the water undertaking, he reports that the quantity of water delivered in the past year was 319,237,448 gallons, or 21·33 gallons per head of the population. The highest delivery in recent years was in 1878, when 452,211,640 gallons, or 38·80 gallons per head of the population, were sent out.

The reports above noticed were presented to the Council at their meeting last Tuesday.

REDUCTION IN PRICE.—The Leatherhead Gas Company have reduced their price from 5s. 3d. to 5s. per 1000 cubic feet. By prompt payment this figure is reduced another 6d.; so that the charge in reality is 4s. 6d. per 1000 cubic feet.

THE EXHIBITION OF THE ROYAL CORNWALL POLYTECHNIC SOCIETY.

In the JOURNAL some weeks ago we mentioned that special interest would attach to the annual exhibition of the Royal Cornwall Polytechnic Society, which was to be held at the Polytechnic Hall, Falmouth, in the present month, from the fact that an important feature would be a display of domestic lighting by electricity, gas, oil, and candles. We are pleased to find that a large number of makers of lighting and other appliances co-operated with the organizers of the exhibition; the result being a good representative collection, which was opened to the public last Tuesday with an address by the Right Hon. Leonard H. Courtney, M.P. Among the well-known firms who exhibited, the following may be mentioned:—The Wenham Company, Limited; the Schülke Gas-Lamp Company, Limited; the Gas Apparatus Company, of Peterborough; the Fourness Regenerative Lamp Company; the Birmingham Lamp Company; Ridsdale's Lighting Company; the Excelsior Lamp Company; the Defries Safety Lamp Company; the Kerosene Company; Price's Patent Candle Company; Messrs. W. Sugg and Co., Limited; Messrs. Henry Greene and Sons; Messrs. Thompson and Powell; Messrs. Alex. Brown and Co.; Messrs. Cathcart and Peto; Messrs. G. Kynoch and Co.; Messrs. S. Cox and Sons; Messrs. Hawkins and Barton; Mr. F. Siemens; Mr. G. Pearne (for the Wanzer Manufacturing Company); Mr. J. Shaw; Mr. J. J. Royle; Mr. W. S. Olver; and Mr. H. L. Müller, Limited. The following is a list of the awards:—

First Silver Medals.—Messrs. A. Brown and Co., for their "Lucient" regenerative gas-lamps; the Excelsior Lamp Company, for petroleum lamps with Postlethwaite's patent duplex burner; the Defries Safety Lamp and Oil Company, Limited, for their 62-candle power oil-lamp.

Second Silver Medals.—Ridsdale's Lighting Company, Limited, for Ridsdale's regenerative gas-lamp with majolica body; Mr. J. Shaw, for his patent gas-governor; Mr. G. Pearne (the Wanzer Manufacturing Company), for an assortment of lamps and portable cookers; Mr. W. S. Olver, for a 46-candle power oil-lamp.

First Bronze Medals.—Messrs. Cathcart and Peto, for electric lamps and fittings; Messrs. Thompson and Powell, for an 8-light sun carbon cluster; Messrs. W. Sugg and Co., Limited, for Argand and other gas-burners; the Schülke Gas-Lamp Company, Limited, for their regenerative gas-lamp adapted for existing fittings; the Wenham Company, Limited, for an exhibit of Mr. Leeds's floor-warming stoves; * Messrs. Hawkins and Barton, for their patent self-governing gas-burner.

The Judges—Professor C. J. Lambert and Messrs. Buckley, Fox, and Philp—commended highly the safety hand-lamps exhibited by the Defries Safety Lamp and Oil Company, Limited, as well as their petroleum stoves; they also commended Mr. Joslin's patent indicator for showing the hourly rate of gas consumption, exhibited by Messrs. W. Sugg and Co., Limited.

One of the rooms in the building was used for the purpose of photography; and this was lighted by a single "Lucient" lamp of 200-candle power. In the annex, known as the Institute Room, there were two large clusters of Parkes's sun carbon lights; two smaller lights of this firm being employed to light the room adjoining the office of the Secretary (Mr. E. Kitto, F.R.M.S.), under whose supervision all the arrangements of the exhibition, which closed last Saturday, were carried out.

During the period of the exhibition, several interesting lectures were delivered on subjects related to the work of the Society by whom these annual displays are organized. The first was given on the evening of the opening day by Professor C. J. Lambert, of the Royal Naval College, Greenwich; his subject being "Domestic Lighting." Having commenced by demonstrating that combustion is not destruction but construction, and by showing the properties of various gases by means of several successful experiments, in which he was assisted by Mr. J. W. Buckley, Manager of the Falmouth Gas-Works, he urged that where gas is burnt there should be abundance of ventilation, and no gas-stove should be placed in a house without a flue. He also proved that small gas-burners are the most wasteful; and asserted that the more brilliant lights (the same quantity of gas being consumed) did not increase the heat. After explaining the incandescent and regenerative systems of gas lighting which are producing such good results, he dealt with water gas, confessing that while he held that it might be very useful for manufacturing purposes, he had doubts whether it would ever be employed for illuminating purposes. With ordinary care petroleum gave splendid results, and was twice as cheap as gas. Electricity was evidently, he thought, the "light of the future;" but for small installations it was not likely to supersede either gas or petroleum. For a 30-lamp electric installation, the annual expenses of the light would be £81, against £38 for gas; and for a 200-light installation, £342, against £256. For a 2000-light installation, electricity would be cheaper than gas. His belief, however, was that before many years had passed electricity would be the system of domestic lighting; but holders of shares in gas companies need not despair, as millions a year were obtained out of the residual products of gas making. Besides, many engineers believed that the gas-engine was the engine of the future; and as gas would, in consequence of the increasing number and value of the residuals, be produced cheaper, and the light be greatly improved by means of the incandescent and regenerative systems, there was no doubt gas as well as petroleum would make a very good fight of it. Still he believed they could look forward to the time when their houses would be illuminated by electricity, and warmed and ventilated, and their food cooked, by gas-stoves; and when everything in the kitchen would be bright, cool, and clean—the smutty, black, and smoky kitchen range being regarded as a relic of a barbarous and extravagant past.

THE ELECTRIC LIGHTING OF COWPEN.

Is it a success? is the question placed at the head of an article dealing with the lighting of Cowpen by electricity, which recently appeared in the *Newcastle Daily Leader*; and judging from what our contemporary says, the answer to its query must certainly be in the negative. From information that came to hand, we were led to believe—as will be seen by a paragraph in last week's JOURNAL—that the electric lighting contractors (Messrs. Nicholson and Jennings) were already giving the inhabitants a "great deal of satisfaction;" but after perusing our contemporary's remarks on the matter, one cannot but incline to the contrary opinion. The writer commences by saying that "the members of the Cowpen Local Board are evidently an enterprising body of gentlemen, possessed of a commendable desire to be abreast of the times. They are showing the way to larger towns in the matter of street lighting, for gas has been discarded, and the village is now rejoicing under the rays of the electric light. But, perhaps, even amongst the members of the Board itself, there is only a moderate amount of rejoicing; for it cannot be said that the new

* The Company also showed, but not for competition, eight regenerative gas lamps.

light has so far been as satisfactory as was expected. There it is, however, and improvement or no improvement, the inhabitants will have to be satisfied with it for the present." The difference which arose between the Board and the Gas Company as to the purchase of the public lamps is referred to at length. The Company, it will be remembered, wished the purchase price to be the same as that which the South Blyth Local Board had agreed to; but the Cowpen Board said that 35s. was too much, and offered 3s. 9d. per lamp less. This being refused, they proposed arbitration; but the answer of the Gas Company was that 35s. was the price fixed by an arbitrator for the lamps in South Blyth. Then negotiations were broken off; and the Local Board took the bold step of deciding to have the electric light. The article proceeded: "But has the change given satisfaction? There is little difference of opinion; and the prevailing feeling is that of disappointment. In the first place, the electric light is dearer. There were 150 gas-lamps in the Cowpen district; and under the system of payment by meter, it was estimated that, after several new lamps had been put up, the cost would be something over £400 per annum. The price now being paid for the electric light, under the five years' contract, is £575 per annum; while £25 is to be paid for each new lamp that may be erected. By walking the streets, it is easy to see how the light itself fails to give satisfaction. The Cowpen district covers a wide area; and there are only 18 lamps to illuminate it. These lamps are placed on poles about 30 feet high, the arc light being used; and even if they burnt steadily, the number of lamps is not sufficient. But they do not burn steadily. They have a playful habit of dropping away in their power at times. Each light is said to be of 2000-candle power; but, as a pitman said on Wednesday night, 'the candles must be aafal smaal ones sometimes.' Worse than all, the lights sometimes go out entirely; and the neighbourhood is darkened until they have been re-lit. The Board has a nice little clause in the agreement, that £5 has to be paid them for every lamp that is out an hour; and this may work well. But it is only fair to the electricians to say that they have had several difficulties to contend with, and the lights are more regular now than they were a fortnight ago; while they say that, as soon as they get thoroughly to work, they will be able to give a brilliant and steady light. But even if that be done, there will have to be more lamps. Within a radius of a few yards of each lamp, the light is brilliant enough; but the poles cast long shadows on the ground, while nearly all the back streets are plunged in total darkness. Now the back streets are much used, and to say their present darkened state creates inconvenience is to put it mildly. The people look upon the light as an experiment, and are not disposed to be too critical at first; but if satisfaction is to be given to all, several new lamps will have to be erected. It is but poor consolation that can be had from the thought that if your end of the street is in semi-darkness, the other end is brilliantly lit. But it is more than strange to learn that all the quarrel has taken place over a difference of 3s. 9d. for gas-lamps. The total amount in dispute was less than £30; and it is singular that the matter could not be settled without a 'strike.' A little disposition to give way a point or two would have been beneficial on both sides."

Dorking Gas Company.—From an available balance of £1209, the Directors of this Company recommend the prescribed dividends at the rate of 10 and 7 per cent. per annum on the various classes of shares for the past half year. The expansion of the Company's business, it appears from the Directors' report, is much retarded by the extensive use of cheap mineral and other oils in the Company's district; but they feel confident that a substantial and progressive increase in consumption will result from the reduction from 4s. 2d. to 3s. 9d. per 1000 cubic feet, which they made at the commencement of the current half year. The Directors feelingly allude to the death, on the 19th ult., of the Company's Secretary (Mr. J. D. Down), who has held the appointment since the incorporation of the Company in 1871.

The Management of the Heywood Gas-Works.—At last Thursday's meeting of the Heywood Town Council, Mr. Healey referred to the appointment of Mr. W. Whatmough, the late Chief Collector, to the position of Gas Manager, and said it was understood that some arrangement was to be made with Mr. H. Hawkins to be a kind of guarantee for the success of the works. He hoped the new arrangement would turn out well; but he had doubts about it. Alderman Marlor explained that, so far as the Corporation were concerned, there was no arrangement with Mr. Hawkins. He had kindly and generously offered to render help; but beyond that they had nothing to do with him. Alderman Hodgkinson and Mr. Lawton protested against the revival of the question after it had been settled; and said it was Mr. Healey's fault if he was not at the last meeting. From the minutes of the Gas Committee, which were confirmed, it appeared that their thanks were formally tendered to Mr. Hawkins for his offer to render assistance to the new Manager.

Northern Coal Trade.—There was a good inquiry for coal, especially for gas coal, last week. To some of the Baltic ports there is a falling off in the demand for steam coal, as is common at this season of the year. But the demand from the South is better than it usually is; and with the possibility of higher wages being paid there is a decided firmness in the price. For best Northumbrian qualities, the general quotation is 10s., and there is full work. Second-class coals are not quite in such strong demand, and about 9s. is the current price. For small coal the inquiry is good. Gas coal is strongly in request, and all the collieries having contracts with London have been sending so freely that the rate of freight for steamers from the Tyne to London has risen to 4s. It is rumoured that, for the large local gas coal contract, about 9s. per ton will be generally asked, which would be an advance of more than 2s. per ton. Of course, against this is to be set the higher price of coke, which is in great demand just now. Of gas coke there is now so large a local consumption that it is believed 1000 tons weekly are used by cement makers alone.

The Public Lighting at Leamington.—The dissatisfaction at the way in which the electric lighting of Leamington has been carried out has been publicly expressed on many occasions in the Town Council; and another was afforded to the objectors to the system of illumination at the meeting of the Council on Monday last week, when a proposal was brought forward to hold a special meeting to consider a report of the Watch Committee on the question of making a change in the lighting of the Parade. Samples of Bray's and Sugg's lamps have been put up so as to assist the municipal authorities in coming to a decision; and the Watch Committee are furnished with complete statistics in regard to the capacity and cost of each of these systems of gas lighting. The proposal was agreed to; but its discussion gave Mr. Crowther Davies an opportunity of having another "fling" at the electric lighting on the Parade, which he characterized as an "illustration of darkness." This remark appears to have been fully justified, seeing that in the previous week no less than seven of the lamps were extinguished. Mr. Crowther expressed the hope that before the expiration of the present year the Parade would be lighted by gas—a hope in which doubtless many of the inhabitants will join.

LIVERPOOL CORPORATION WATER SUPPLY.

The Engineer's Annual Report on the Vyrnwy Works.

The Water Engineer of the Liverpool Corporation (Mr. G. F. Deacon) issued last Wednesday his annual report on the progress of the Vyrnwy Water-Works. These gigantic works were commenced about eight years ago; and the date at which the water supply was to have been introduced into the city has already been exceeded. But this is chiefly due to the unforeseen difficulties which have been met with. At this period twelve months ago the masonry dam at Vyrnwy, the Hirnant, Cynion, and Llanforda tunnels through the mountains between Vyrnwy and Oswestry, the Oswestry filter-beds, the balancing and receiving reservoirs at Parc Uchaf, Oswestry, and Malpas, and the intervening pipe-line were practically completed. Besides this the Cotebrook reservoir was two-thirds constructed; that at Norton, near Runcorn, was advancing rapidly; and the works at Prescot were in a very forward stage. The only important unfinished works connected with the aqueduct now are the Weaver Navigation inverted syphon, the Norton tower, the Manchester Ship Canal subway, and the aqueduct tunnel under the Mersey. The other works are entirely completed. As to the crossing beneath the Weaver Navigation, the contractor has undertaken to carry it out by Oct. 15; the Norton tower may not be completed this year, but six or seven million gallons a day can be obtained without it; whilst for the subway under the Ship Canal, the Engineer is not responsible. It is being constructed by the Canal Company's contractor; and some promise appears to have been made that it will be completed before the aqueduct under the Mersey. The Weaver syphon, the Ship Canal subway, and the Mersey aqueduct are, however, difficulties that have been forced upon the Corporation.

Speaking of the Mersey tunnel, Mr. Deacon says it was not "a work contemplated by the Corporation or their Engineers. It has been forced upon them, notwithstanding the fact that all the possible requirements of the future navigation of the Upper Mersey would have been abundantly satisfied by the original scheme (of laying the pipes in the river bed), which might have been executed at moderate cost and without difficulty or risk." The Mersey aqueduct tunnel has in fact proved to be, from an engineering point of view, the real crux of the whole scheme; and it is upon it that during the past year the greatest amount of labour has been expended. The Engineer thus describes the position: "The cost of this work will probably be about £25,000. I had prepared no estimate for it, as the intention had been to lay the pipes in the bed of the river in the usual, and what appeared to both the Engineers, the rational method. The cost of constructing a tunnel arises entirely from the unexpected conditions imposed upon the Corporation by a reference to the Board of Trade under the Liverpool Corporation Water-Works Act, 1880. The estimated cost, £8421, was abundantly sufficient to complete the work as originally intended. The general dimensions upon which the specification and contract for this work were based are as follows: Depth of Cheshire shaft, 86 feet; depth of Lancashire shaft, 104 feet; distance from centre to centre of shafts, 800 feet. The shafts and tunnel are to be lined with cast iron; and by another contract provision is made for the construction and fixing in the tunnel of the steel tubes through which the water will pass. The Cheshire shaft has been completed and lined; and the depth has been made 84 ft. 9 in. The tunnel has been driven and lined to a distance, from the centre of the Cheshire shaft, of 57 ft. 6 in. The Lancashire shaft has been sunk and lined to a depth of 82 feet. When the Cheshire shaft had been practically completed and lined, and when the tunnel had been driven for a short distance from the side thereof, a portion of the timber at the face of the heading gave way, and a rapid inrush of sand and water took place. As pumping the water would probably only have increased the ingress of sand, and would almost certainly have failed to enable the contractors to continue the excavations, it was determined to work under artificial pressure. The Cheshire shaft was accordingly provided with an air-tight decking and air lock at about 65 feet from the surface, and air was pumped down by compressors above. By this means, and under pressures of from 2½ to more than 3 atmospheres, the excavation was successfully continued. On the Lancashire side, it was found impracticable under ordinary atmospheric pressure to sink the cast-iron cylinders below 82 ft. 9 in. from the surface. Artificial air pressure, as in the Cheshire shaft, was therefore employed. The sinking is now being successfully continued, and has reached a depth of 86 feet."

In regard to Lake Vyrnwy, Mr. Deacon states that on Nov. 28, 1888, the discharge-valves through the masonry dam were closed, and the water of the lake was allowed to rise. Although the rainfall from that time to the end of August had been about 14 per cent. below the average, and the statutory compensation water had been regularly given, the content of the lake is now about 10,500 million gallons. The surface area is about 1051 acres at a level of 9 feet below the overflow. The content, when the water reaches the overflow level, will be 13,125 million gallons, and the surface area 1121 acres. During the rise of water in the lake most accurate observations of the behaviour of the dam were made; and the deflection proves to be less than was computed from the resistance to compression of the separate materials of the dam as ascertained by experiment, and it is much less than one would be led to expect from the analogy of the only observations which, so far as Mr. Deacon has been able to ascertain, have been made upon the resistance of other masonry dams. The water draining from the foundations, and from the dam itself is also insignificant—a small fraction only of the amount anticipated from the experience of other undertakings of a similar kind. The dam was so far completed in November, 1888, that water might be safely impounded to the highest proposed level. Much work, however, remained to be done; and the number of masons required during the present year for the completion of the superstructure of this work and other buildings in the neighbourhood has been greater than at any former time. It has been found practically impossible, even with the help of increased wages, to keep the desired number together. The consequence is that the final completion of the masonry is being much retarded. The flood-gauging weir is also still incomplete; but the whole of the masonry has been prepared, and it is expected that the gauge will be finished in the course of a few weeks, and will therefore be ready to record the first floods that are discharged over the dam. As to the lake itself, Mr. Deacon observes that the proportion of stone contained in the soil around is so large that, on every occasion of a high wind, a shingle shore is rapidly formed; and from general observation of the action of the waves upon the banks, he is led to think that very little artificial protection of the sides will be necessary in future. The masonry of the straining tower is completed; and the roof is being constructed. The contractors for the ironwork have greatly delayed the interior floors and machinery; but it is fully anticipated that the tower will be in working order before the end of this year. The copper-wire gauze through which the water will be passed in this tower will have 14,400 meshes to the square inch.

In addition to construction, the report deals with finance. The final estimate of the cost of the scheme in 1878 was £1,559,996; the probable total is now given at £1,832,391. Three causes are assigned for the excess—the enlargement of Lake Vyrnwy; the construction of a masonry

instead of an earthen dam; and the construction of the Mersey aqueduct tunnel. Of course, in addition to the actual expenditure on the works, there are other items of outlay. These amount in all to £191,137, and they are enumerated as follows:—Purchase, as a matter of policy, of the portion of the Vyrnwy Estate not required for the works, £53,000; charging mains and contingencies connected therewith, £4800; purchase, as a matter of policy, of the land required for the filter-beds and clear water reservoirs of second and third instalments of the works, £13,332; Mersey crossing, additional cost for tunnel, £16,231; add, if mechanical washers and buildings are adopted, £2900; law charges, valuer's fees, engineer's commission, money compensation to Severn and Marchnant interests, investigation as to stability of Vyrnwy dam, inaugural ceremony, with certain other similar payments, £100,207; one-third of cost of Vyrnwy Hotel (two-thirds, upon which rent will be received, is charged to estate), £1667. This makes the total probable cost £2,024,528; but next year Mr. Deacon says that he hopes to prepare a statement concerning the completed undertaking.

THE BURY CORPORATION WATER UNDERTAKING.

The Bury Corporation recently entertained to dinner the representatives of all Local Authorities who assisted in the promotion of the Bill passed during the late session to relieve Bury of a portion of its obligations on account of the water undertaking. The position of the Corporation in this respect was set forth in the JOURNAL for the 27th ult. (p. 421). In the course of the proceedings, Alderman Peers stated that last year the call upon the ratepayers within the municipal area was upwards of £9000 for the sinking fund alone, and they would have had to pay off the water-works undertaking obligations (which stood to-day at over £600,000) in something like 38 or 39 years. As regards substantiality, water-works were only second to Consols. Speaking in round figures, he might say that the ratepayers of Bury were doubly taxed—they had to pay the ordinary water-rate and then to pay another almost as great for the sinking fund. They felt they were in a position that bore hard upon the industries of the town; and they considered that they ought to try and remove this burden. He commented upon the assistance cordially rendered by the outside authorities in their effort; and, as a result of their work, instead of the borough having to pay annually towards the sinking fund the sum of £9000, they had only to pay £1700. He predicted that if they had only the same progress during the next ten years as they had had since the water-works were acquired, the undertaking would be a great success, and would provide a sum for the increase of the water supply.

A statement just issued shows the present position of the undertaking as compared with 1872. In this year the capital expended amounted to £238,321—a figure which has been increased to £394,637; while the loans, stock, &c., have advanced from £42,862 to £171,643. A sum of £38,041 now stands to the credit of the sinking fund account, which had not been opened in 1872. The total revenue of the undertaking has advanced from £17,118 to £31,714; the increase in water-rentals amounting to £9620 of the difference between these two sums. The Committee now supply 28,973 houses, representing an estimated population of 144,865. Of these houses, 12,069 are within, and 16,904 without the borough area. In 1872 the houses supplied numbered 18,013 (of which 8205 were within, and 9808 beyond the borough limits); the increase in the number of services being no less than 10,960. The number of meters supplied has advanced from 462 to 849. Amongst the items of expenditure are: Rates and taxes, £3235, against £1632 in 1872; maintenance, £3669, against £1861; dividends and annuities, £17,159; against £11,030; and interest, £6534, against £2057. One of the most interesting portions of the table relates to the advance in the yearly instalments of the sinking fund. In 1878 the amount charged under this head was only £67. By 1880 it had gone up to £327, and for the next five years it did not exceed £470. Then in 1886 came a sudden increase to £5851, further advanced in each of the two succeeding years to £8974. In the present year it reached the maximum, £9054. Owing to the relief which the Act just obtained will afford, the amount will in future years be decreased to £1714 10s.; so that the ratepayers have some excuse for "making merry" over the success of their last appeal to Parliament.

STOCKTON AND MIDDLESBROUGH CORPORATIONS' WATER SUPPLY.

COMMENCEMENT OF THE BLACKTON RESERVOIR.

On Monday last week, the Mayor of Stockton (Mr. Alderman Nelson) performed, in the presence of the Chairman (Mr. Hugh Bell) and the members of the Stockton and Middlesbrough Water Board and a large number of gentlemen occupying prominent positions in the district, the ceremony of cutting the first sod of the new reservoir which the Board are about to construct at Blackton—the upper one of the two large reservoirs in the Balder Valley for which the Board obtained authority by their Act of 1876. The embankment is to be placed at the western extremity of the present Hury reservoir; and when completed and full of water the reservoir will have a depth of 61 feet, a water area of about 75 acres, at its widest part a width of 750 feet, a length of one mile, and a capacity of 460 million gallons. The top water will be 925 feet above Ordinance datum, and 65 feet above the top water of the Hury reservoir. The embankment will be 700 feet long, 77 feet high, 20 feet wide at the top, and 375 feet wide at the base. It will be composed as follows:—In the centre, a puddle wall resting on a concrete shoe, with a concrete tongue 6 feet wide carried down into the watertight shale which underlies the whole area of the reservoir. This puddle wall will rise to within 2 feet of the top of the embankment, and will be supported on each side by earthwork carefully spread in thin layers and rolled with a steam road-roller to ensure its perfect consolidation. The outer slope of the embankment will be planted with grass. The lower part of the inner slope will be covered to a depth of 3 feet with broken stone beaching, and the upper part with square stone pitching 18 inches thick laid on a bed of broken stone 18 inches deep. The inner slope of the embankment will be 3 to 1, with three horizontal benchings of irregular form at 904, 886, and 871 feet above Ordnance datum. The inner slope will be 2½ to 1 for 31 feet below the top of the bank, and below this 3 to 1, with a horizontal benching 15 feet wide at the foot of the 2½ to 1 slope. The outlet culvert by which the water of the Balder will be discharged during the construction of the reservoir, will be made principally in the solid rock or shale. It will be 13½ feet in diameter, partly constructed of concrete with blue Staffordshire brick lining, and partly of cast-iron segment plates with internal flanges firmly bolted together. The inlet to this culvert will be bell-shaped. The valve tower, in which there will be a spiral staircase for the purpose of giving access to the valves in the well at the base of the tower, will be constructed of 5-feet lengths of cast-iron cylinders 5 ft. 6 in. in internal diameter, with outer flanges securely bolted together. These cylinders will be carried into the solid rock, where the excavation will be 11 feet in diameter; the space between the ironwork and the rock being filled in with cement concrete. Above the rock the backing of the ironwork will assume an octagonal shape, and be corbelled out to carry the valve-house, which will also be octagonal in form, with an internal diameter of 15 feet. The valve-house will be of rock-faced stone outside and dressed stone inside. A girder bridge will give access from the main embankment to the valve-house, whilst another bridge will lead from the valve-house to a platform on the top of the overflow or waste pit. The delivery of water will be controlled by five valves, each 18 inches in diameter, worked by rods from the floor of the valve-house some feet above top-water level. About 450 yards below the main embankment, a subsidiary dam is to be constructed, for the purpose of diverting the water to be discharged from the Blackton reservoir into the flood-water channel, which is to be made alongside the Hury reservoir when the gravitation works are completed. This dam is to be substituted for about a quarter of a mile of the western end of the flood-water channel, the construction of which would be difficult in consequence of the sloping surface of the ground in that part. This dam will at present only be carried well up out of the reach of the top water of Hury, but will require to be raised about 10 feet higher when the flood-water channel is made. The water in the space between the main embankment of Blackton and the subsidiary dam will then be 10 feet above the level of the water in Hury. A culvert 12 feet high and 12 feet wide, with a bell-mouthed inlet 15 feet high and 18 feet wide, and valves inserted in the stop, will allow the water impounded to be discharged into the Hury reservoir when necessary. The dam will have a puddle wall resting on a concrete shoe, and supported by earth-work, with a slope of 3 to 1 on the up-stream side, and 2½ to 1 on the down-stream side. Both slopes will be covered with stone pitching 15 inches thick on the top of 15 inches of broken stone. The first work of the contractors (Messrs. W. Scott and Co.) will be the construction of the subsidiary dam and the outlet culvert of the reservoir together with the walls at the foot of the outer and inner slopes of the embankment. As soon as these are out of hand, the filling of the Hury reservoir may be commenced, as the works will then be in such a position that the water in Hury even when full will not interfere with the contractors' operations. The rest of the work can then be carried on in safety. After the ceremony, the party proceeded to Hury, at which place Mr. Hugh Bell gave a general description of the undertakings of the Water Board. In the evening the company dined at Barnard Castle.

THE WATER SUPPLY OF VIENNA.—A telegraphic despatch from Vienna last Wednesday states that the city is at the present moment seriously menaced by a water famine owing to the prolonged droughts in the Alpine regions near the Semmering, whence the drinking water of the capital is obtained. The Mayor has issued orders for the closing of the aqueduct which supplies the water used for watering the streets and the public gardens and for certain forms of motive power.

THE RECENT CONCESSION TO THE GASLIGHT AND COKE COMPANY'S WORKMEN.—At a meeting of all the hands in the mechanical and yard departments of The Gaslight and Coke Company, held at the Shoreditch station on Monday last week, the following resolution was carried unanimously and with much enthusiasm:—"That the sincere thanks of this meeting be gratefully tendered through Mr. Randell, their Engineer, to the Directors of the Gas Company, for their liberal concession to the reduction from ten to nine hours for a day's work, and also corresponding advantages to piece-work men."

THE HASTINGS TOWN COUNCIL AND ELECTRIC AND GAS LIGHTING.—Lighting matters took a prominent place among the questions considered by the members of the Hastings Town Council at their last meeting. On the recommendation of the Public Lighting Committee, it was resolved to apply for a Provisional Order authorizing "the supply of electricity by the Council for the lighting of streets or places and buildings under the control of the Council." It was stated that it was not intended to apply for power to supply electricity for private lighting. The same Committee reported that they had asked the Directors of the Gas Company for an explanation of the fact that the illuminating power of the gas on the evening of July 22 was found upwards of a candle below the required standard. The Town Clerk in reply received the following letter from the Company: "Your letter of the 17th ult. was to-day laid before the Directors of the Gas Company; and I was directed to request that the Lighting Committee should ask the Gas Examiner for an explanation of the discrepancy of figures contained in his report." The correspondence on this subject in the *agenda* included a letter from the Gas Examiner to the Town Clerk, stating that he was quite unable to explain the discrepancy between the photometrical results obtained on July 22. He had no doubt whatever that they fairly represented the quality of the gas at the time the experiments were made, and felt that the matter required some explanation from the Gas Company. Mr. Jenner referred to the reply sent by the Gas Company as a most uncourteous one. He took it that the Company had deprived the consumers of the standard of illumination they were entitled to receive; and he thought that the Company ought to have cleared themselves of suspicion. Alderman Bradnam also commented upon the letter as one of the most disgraceful letters ever sent by one public body to another. If the gas was found below the standard again, he should support action being taken by the Corporation against the Company.

THE LIGHTING QUESTION AT WORKINGHAM.—At a special meeting of the Workingham Town Council last Thursday, the Lighting Committee reported that they had carefully considered an offer of the Gas Company for lighting the streets, and, as a result, desired to place before the Council the following figures:—The Gas Company's offer was to supply 91 lamps, at £2 7s. 6d. per lamp per annum, amounting to £216 2s. 6d., all to be lighted, and 74 to be kept burning up to midnight only, and the other 17 to be left burning till daylight from October to March, and 17 to be lighted and to be left burning till daylight during the summer months. This meant an average loss of six hours per night on 74 lamps for the six winter months. A penny per lamp per night was equal to 6s. 2d. per day, or £55 10s. for the six months. For the summer months the offer of the Company, for 17 lamps, from sunset to sunrise, as compared with the present system of oil lighting, showed a marked deficiency, which meant a loss of £20 5s. on the six months. The amount, considering all things, in favour of the present mode of lighting, they estimated at £117 5s. 10d. In face of these figures, the Committee said that they could only recommend a continuance of the oil lighting, and they proposed that a tender they had received for oil should be accepted. Mr. Watts remarked that the streets were better lighted by gas than by oil; and though it cost more, the inhabitants would prefer to have gas. Mr. Hall maintained that under the present system of lighting they saved £100 a year. The ex-Mayor said he was sure the shareholders of the Gas Company would meet the town fairly in this matter. A great deal of ill-feeling had been caused over this question; and he would do all in his power to get it settled. Mr. Watts moved, and Mr. Churchman seconded a resolution to the effect that an inquiry be made of the Gas Company whether they would light the present lamps of the town for the same number of hours, as during the past year, as mentioned in the Lighting Committee's report, for the sum of £216 2s. 6d.; and in the event of non-compliance or non-acceptance by the Gas Company, to promptly close the contract for oil. This was agreed to.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

The Edinburgh Town Council had before them, at their meeting on Monday last, the question of electric lighting. The Lord Provost said that they had so lately acquired for the city the power to light it, that it would be a very unwise thing on the part of the Council to allow that power to pass into other hands. The notices of the electric light companies had been considered in Committee; and he moved—"That the Magistrates and Council, having considered the notices, refuse to give their consent, and instruct the Town Clerk to intimate refusal to each of the Companies. *Quod ultra*, remit the subject of electric lighting to the Lord Provost's Committee, with powers to take such steps as they may consider necessary or expedient; and, if they may think fit, to support any action that the Edinburgh and Leith Corporations Gas Commissioners may take." Mr. Colston, in seconding the motion, said this was the only thing they could do in the circumstances. They had no desire to retard the progress of electricity in the city. At the same time they must take care not to allow the establishment of another monopoly that they might have to buy up at a large figure. The motion was agreed to; and the further development of the question will be matter of interest.

The Perth Gas Commissioners this week let to Messrs. D. and R. Taylor the contract to build the piers for the new gasholder tank at a cost of £810.

According to the report of the St. Andrews Gas Company, the past year has been a very successful one; but the information given to the shareholders is somewhat meagre. This is not to be wondered at, in view of the steps, referred to in the report, which have been taken by Provost Paterson for the transfer of the Company's undertaking to the Corporation. Mr. Paterson went the length of litigating over the proposed transfer; but he has not taken advantage of the privileges which the Court conferred upon him, and at present there is not much transfer evident. All the same, the Directors were guarded in their report; and while making a good show of the work accomplished, they have not revealed their hand to the transfer party. The low price of gas is a feature of the Company; and the reduction of it at the present time, on whatever grounds it may be justified, is certainly good policy, likely to produce contentment in the minds of consumers with the Company's management, and, on the other hand, to take the cream prospectively off the Corporation management, should the concern ever pass to them.

The gas explosion at Banff (referred to in my "Notes" in the JOURNAL a fortnight ago), though a small matter, is causing a deal of trouble locally. This week we have the other side of the question. The Directors of the Banff Gas Company met last Saturday, and accepted the resignation of Mr. A. Watson, their Manager. A resolution was adopted, thanking Mr. Watson for his unwearied attention to the duties of the office for the long period of 58 years. It was then explained that the explosion arose in consequence of a drain having fallen in, leaving a ¾-inch service-pipe unsupported, and that then a road locomotive, or other heavy vehicle, had passed over the place, fracturing the pipe. The explosion itself was caused by a man, who, noticing the smell of gas, applied a lighted match to a grating in the street. When it occurred, the Town Clerk and Chief Constable ordered the gas to be turned off at the works, to allay a groundless panic which had got abroad in the town in anticipation of more explosions. The foreman at the gas-works did as required by these officials; and the Directors, at their meeting last Saturday, resolved that the action of the officials was *ultra vires*, and entirely uncalled for. Respecting the claim of the Police Commissioners to be present at the inspection of the mains and services, they directed a reply to be sent to the Clerk of the Commissioners that they recognized no obligation to allow them to be present, but that out of courtesy they would notify him when the inspection was to take place, and thus give the Commissioners an opportunity of being represented. It was unanimously resolved by the Directors to ask Mr. A. Smith, the Gas Engineer of the Aberdeen Corporation, to make the inspection.

The public lighting expenditure in Aberdeen last year was £4142; but this sum included the erection of 60 new lamps. For the current year the estimate has been fixed at £4154.

The Aberdeen water estimates for the present year have been made up. At the beginning of the year, there was a balance to the good of £1051; but, owing to heavy expenditure during the twelve months this sum has all been used up. It has been agreed to increase the rate on occupiers from 6d. to 6½d. The rate on owners will be 1d. as formerly. The estimates show that at the end of the year there will be a deficiency of £320; but it is not unlikely, owing to the elasticity of the revenue, that the Committee will manage to make the income meet the whole expenditure. The 6½d. rate is still under the amount which it was calculated would be required; it having been estimated originally that a rate of 8d. would be necessary.

The Valuation Appeal Court in Edinburgh on Tuesday had before them an appeal by seven Scotch banks against the valuation of their premises. What was objected to was the entering of the premises under one sum as "houses and offices." The amount fixed was accepted as correct; but the appellants contended that it should be proportionately divided between the office premises and the portions occupied as residences by the officials. The question arose out of a desire to escape paying the domestic water-rate upon the whole premises; and consequently the Water Trust was represented by Counsel. The same question was raised in the Court of Session last year, and was decided against the banks—not on the merits, but because the entry in the valuation roll, being in one sum, precluded the Court from considering the question. Counsel for the Water Trust opposed the application, because the principle, if adopted, could not be limited to the banks, but would require to be applied to all business premises in which officials resided; and this would entail very great confusion in the laying on of the water assessments. The assessor's argument in opposition was that it was nonsense to say that the banks could let a portion of their premises to an independent party, as in that case they might get as tenants a gang of thieves. The entire premises must, he maintained, be held to be in the occupancy of the resident officials. The Court dismissed the appeal; and, at the request of Counsel for the banks, granted a case for the higher Court, so that this somewhat novel, but not unimportant question, will be heard of again.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

I am glad to be able to say that, at a special meeting of the Glasgow Corporation Gas Committee, held on Wednesday—the Lord Provost (Sir James King) presiding—convened to consider the question of filling up the office of Treasurer to the Gas Trust, which had become vacant by the resignation of Mr. Alexander Ross, a unanimous vote was given in favour of appointing Mr. James Fleming to that important post, with which he has been so long connected as the senior assistant in the Treasurer's Department. Of course, the confirmation of the appointment has yet to be made by the Town Council as Gas Commissioners before it can legally take effect. The Gas Committee have recommended a fairly handsome salary to Mr. Fleming—namely, £450 per annum, which is, I am informed, the same amount as was given to Mr. Robert Wilson when he entered upon his duties as Treasurer to the Corporation Water-Works Commissioners. It has not yet publicly transpired that there was any other person besides Mr. Fleming in "the running" for the Gas Treasurership; but I am assured, on the authority of a member of the Gas Committee, that a formal application for the vacant office was made in writing by a gentleman who once occupied a high position in the Corporation. That gentleman also systematically canvassed the members of the Gas Committee, and seemed to think that he had a good right and title to press his claims upon their consideration. In what respect his claims are superior to those of Mr. Fleming, I have not yet been able to learn; and the fact that the Committee voted unanimously in favour of the principal assistant in the Treasurer's Department shows that they had no doubt as to who was the fittest man for the post, or had the prior claim to it.

The Valuation Appeal Courts have been at work this week, and I have learned that within the area which I am called to survey, there were at least three gas companies that had appeal cases before the Commissioners. At the sitting of the Court for the Upper Ward of Renfrewshire on Thursday, Mr. Gillies, Solicitor, Glasgow, appealed on behalf of the Pollokshaws Gas Company against the valuation of £500 on their works, and asked that a reduction should be made to £300. He pointed out the rule usually followed for the valuation of works similar to those of the appellants; and he said that they had offered to pay 5 per cent. on the total cost of the heritage, being in accordance with the decision of the Court of Session, and not on profits, which were a variable quantity. Mr. Davies, the Assessor, replied that, not to be opening up "old sores," he had continued the valuation of last year as fixed by the Court. The Pollokshaws Gas-Works were, he contended, a steady, dividend-paying concern. During the past financial year the profit of the Company was £928, as against £898 for the preceding year; the gross revenue being, respectively, £3856 and £3732. Although the revenue and the profit were greater than in the preceding year, he had not increased the valuation, which he thought a very reasonable one—indeed, it was rather under-estimated; but he did not wish to alter the entry on the roll in view of the fact that the Valuation Committee had last year given a decision in the case. The appeal was dismissed; and Mr. Gillies asked for a case, which was granted. In the same Court, and at the same sitting, the case of the Mearns Gas Company, Limited, on whose behalf an appeal had been lodged, came up for consideration. The claim was for a reduction from £60 to £30. It was stated that although £90 had been taken from the concern, only £49 had gone to the shareholders, the remainder being used to pay interest on money borrowed from the bank. Nothing had been paid for depreciation. The Assessor held that he had nothing to do with the mode in which the profits were distributed. The appeal was dismissed.

On the same day, at the Annual Valuation Appeal Court for the western portion of Dumbartonshire, an appeal was heard for the Helensburgh Gaslight Company, whose works had been entered on the roll at £1200, in place of £900 as formerly. The appeal was supported by Mr. George M'Lachlan, Solicitor, Helensburg, who argued that as there had been no increase in plant or property, but a depreciation—caused by the Company having to relay a large extent of pipeage—the old valuation should be upheld. Mr. Webber, the Assessor, on the other hand, stated that he had not entered the property it its full value. Had he followed the decision in the well-known Dundee appeal case, he would have been entitled to have entered it at £1932. The Court unanimously agreed with the Assessor that the valuation had been too low, and dismissed the appeal. One of the Glasgow evening papers, referring to this appeal case, indulges in the following remarks:—"At last! A big secret is out through the Dumbartonshire Appeal Court. Helensburgh Gas Company clears £2000 a year. Anxious inquirers after truth may now figure out for themselves the handsome bonus that falls to be superimposed on the customary 10 per cent. dividend. There are no shares for sale." Where that information has been obtained I know not.

At a meeting of the Gourock Burgh Commissioners in Committee, held last night, it was recommended that the price of gas be reduced from 4s. 4½d. to 4s. 2d. per 1000 cubic feet.

Quite a little rupture seems to be imminent between the Largs Burgh Commissioners and the local Gaslight Company, the *casus belli* being in reference to the amount of gas consumed in the burgh lamps. The facts of the case seem to be as follows:—The streets of the town, before the adoption of the Scotch Police Act, were lighted by the Gas Company; and an addition was made to the gas consumers' bills to pay for the gas burned. When the place was constituted a burgh, the duty of lighting the streets devolved on the Police Commissioners. For the purpose of arriving at a fair estimate of the amount of gas consumed, two lamps in each of the two districts into which the burgh is divided for lighting purposes were provided with meters; and the average consumption of these four lamps was taken as the consumption of each of the lamps throughout the burgh. As the lamps were originally distributed, that arrangement of meters doubtless gave a very fair and just basis on which to calculate the total consumption of gas. But recently the outskirts of the burgh have received considerable attention in the way of lighting at the hands of the Commissioners, and lamps now extend to the extremities of the burgh boundaries. The Commissioners hold that as all the meters are pretty well in the centre of the burgh, and where the lamps are first lit and last extinguished, they have been paying for more gas than they have consumed—the lamps at the burgh boundaries burning from an hour to two hours less every night than those which have the meters attached, while no lamps burn more than a few minutes longer than the metered lamps. They suggested to the Gas Company that to shift the meters, so that one would be placed on the lamp first lighted and last extinguished, in each district, and one on the lamp lit last and first extinguished, would give a fair calculation of the total gas consumed. The Directors of the Gas Company have not seen fit to agree to the proposal; and the consequence is that the Commissioners, at their monthly meeting held last Monday evening, have resolved that the lamps are to be extinguished in the same order as they are lighted. This will give, they hold, a perfectly fair basis for calculating the total consumption, as every lamp within the borough will burn for the same length of time. It will not be so convenient, however, to have the lamps extinguished in the centre of the borough first; and it seems a pity that the Gas Company's Directors did not see their way to consent to the Commissioners' proposal.

The course of the Glasgow pig-iron warrant market this week has been disappointing for holders. Though the general position remains strong—more so than it had been for some years, the consumption largely exceeding the production—values of warrants have shown a decidedly declining tendency. There has been a lot of selling—some of it wholly inexplicable, unless for the reason that "bulls" even are aiding the decline in order to lock up at a lower point. The fluctuations in the price of Scotch iron have been between 46s. 3d. per ton cash on Wednesday, and 46s. 8½d.

yesterday. Scotch special brands are firmly quoted. The legitimate trade business is very active all round.

An exceedingly active demand for coal is showing itself in all directions, and prices are tending upwards. In nearly all the mining districts the miners' wages have been advanced.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Sept.* 14.

Sulphate of Ammonia.—A quiet feeling prevailed at the beginning of the week, when prices suffered a slight relapse; but there have since been fair orders for home consumption and export, which have absorbed all near supplies. The aims of some of the speculators to influence prices by fictitious reports of business transacted, have again been checked; and as shipments from the London market are meanwhile suspended, all requirements have still to be furnished from the provincial ports. Except at full rates, makers decline to sell in advance; and a continuance of this course of action, whilst the production is so slight, must have the effect of maintaining values, particularly as there is little fear of any quantity of sulphate being offered from second-hands to interfere with the position. To-day's prices are £12 3s. 9d. to £12 5s., Hull; £12 5s., Liverpool; and £12 2s. 6d., Leith. Nitrate prices are a shade lower—both on spot and for cargoes.

LONDON, *Sept.* 14.

Tar Products.—Anthracene has been more freely bought during the week; and this has resulted in a firmer price for spot and forward deliveries of this article. Benzols have "eased off" during the week; and they are by no means so strong as was expected—the recent advance evidently springing from speculative operations. Pitch continues well inquired after; and there seems every likelihood of higher prices being touched. Carbolic acid and other products remain about the same as last week. Prices may be taken as follows:—Tar, 21s. to 27s. 6d. per ton, according to position. Benzol, 90 per cent., 3s. 1d. per gallon; 50 per cent., 2s. 2½d. per gallon. Toluol, 1s. 5d. per gallon. Solvent naphtha, 1s. 4d. per gallon. Crude naphtha (30 per cent.), 1s. per gallon. Light oil, 3¼d. per gallon. Creosote, 2¼d. per gallon. Pitch, 22s. to 23s. 6d. per ton. Carbolic acid (60's), 3s. 7½d. per gallon. Cresylic acid, 10d. per gallon. Tar salts, 15s. to 20s. per ton. Anthracene (30 per cent.), "A" quality, 1s. 2d. per unit; "B" quality, 11d. per unit.

Ammonia Products.—Sulphate of ammonia is not quite so strong; and business has been done at prices ranging from £11 15s. to £12. Prices: Gas liquor (5° Twaddel), 7s. to 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¼d. per lb. Carbonate of ammonia, 3¼d. per lb. Muriate of ammonia, brown, £19 10s. per ton; white, £28. Sal-ammoniac, £33 to £34 per ton.

THE BARNSTAPLE WATER COMPANY AND THEIR CUSTOMERS.—In consequence of what are considered to be exorbitant demands made by the Water Company, the Barnstaple Gas Company have taken steps to render themselves entirely independent of the regular service. A well has been sunk in the yard connected with the works; and from this the water will be pumped into an enormous tank, capable of containing 8000 gallons. Other large consumers are about to adopt a similar scheme, as a practical protest against the demand made upon them by the Water Company.

HARROW DISTRICT GAS COMPANY.—In the report on the working of this Company during the half year ending June 30 last, which the Directors will present to the proprietors at the ordinary general meeting on the 30th inst., reference is made to the gratifying fact, from the consumers' point of view, that the price of gas since the commencement of last year has been reduced to the extent of 6d. per 1000 cubic feet; and the Directors express the hope that this will conduce to a greatly increased consumption. The balance of the profit and loss account is £1696 19s. 10d., out of which dividends at the rates of 7½ per cent. per annum on the "A" capital, 7 per cent. per annum on the "B" capital, and 5½ per cent. per annum on the "C" capital, all less income-tax, are recommended.

SHREWSBURY CORPORATION WATER SUPPLY.—The members of the Shrewsbury Town Council were engaged for a considerable time, at their meeting yesterday week, in considering reports which had been prepared by the Gas, Water, and Lighting Committee and Mr. Baldwin Latham, C.E., dealing with projects for augmenting the water supply of the borough. The scheme which was adopted, on the recommendation of the Committee, proposes a new intake in the River Severn; and the cost of the necessary works are estimated at £30,000. The Town Clerk was instructed to give notice, by public advertisement, of the intention of the Corporation to promote a Bill in Parliament for the purpose of constructing the works. In next week's JOURNAL, we shall endeavour to give some further particulars respecting the scheme which has met with the approval of the Council.

HASTINGS WATER SUPPLY.—At the monthly meeting of the Hastings Town Council last Friday, the Borough Surveyor (Mr. P. H. Palmer) presented a scheme for consideration, by which it is proposed to abolish one of the pumping-stations (known as No. 1) by running the water through a new main 2180 yards in length to No. 2 Buckshole station, and to lay a 9-inch pumping-main from there to the Halton reservoirs, which at present supply unfiltered water to the Clive Vale district. He proposed to erect at Halton a gas-engine and pumps, and supply filtered water instead; and he calculated that, if his suggestions were carried out, there would be an annual saving in the cost of working. The estimated cost of the new works would be £1600; and in the event of the scheme being adopted, the sum of £1200 might be realized for the No. 1 station. The Water Committee recommended the adoption of the scheme, and that application be made to the Local Government Board for sanction to borrow the money. Alderman Hennah moved, and Mr. Brown seconded, the adoption of the report, which was agreed to.

THE REMUNERATION OF THE HEYWOOD WATER-WORKS ENGINEER FOR EXTRA SERVICES.—At the meeting of the Heywood Town Council last Thursday, there was a discussion as to the remuneration to be paid to Mr. Diggle, the Water-Works Engineer and Surveyor, for his extra services in connection with the enlargement of the Naden middle reservoir. A Committee who had considered the subject, recommended that the fixing of the specific amount for these services should be left over until the completion of the work. In the meantime, they recommended that Mr. Diggle should have an advance of £50 a year in his salary, in consideration of his undertaking the construction of the new sewage works and all duties which might in future arise in connection with his office of Surveyor and Water-Works Engineer. Alderman Hodgkinson expressed the opinion that it would be rather shabby to leave the settlement of the extra remuneration to their successors; and explained that Mr. Diggle would be satisfied if the advance of salary recommended went back to March, 1888, which would mean another £50—a mere trifle for a matter of this sort. After a long and somewhat acrimonious discussion, an amendment embodying Alderman Hodgkinson's suggestion as to the dating back of the advanced salary, was carried.

THE ASSESSMENT OF THE SALISBURY WATER-WORKS.—At a recent meeting of the Salisbury Town Council, a communication was received from the Union Assessment Committee stating that they considered the time had arrived for a revision of the assessment of the water-works; and that, with the sanction of the Guardians, they had appointed Messrs. Castle and Castle to make a new valuation of the property.

BELFAST WATER SUPPLY.—At the meeting of the Belfast Water Board last Thursday, the Water Committee were authorized to give notices to holders of mortgages falling due on April 1 next, amounting to £219,916, that the Commissioners will upon that date pay off such mortgages; and they were further empowered to make arrangements for the issue of 3½ per cent. stock under the powers of the Act of last session, to replace existing mortgages, and for such further sums as may be required for new works.

THE QUALITY OF THE WATER OF LAKE VYRNWY.—During the past two months there have been a number of complaints of noxious exhalations from Lake Vyrnwy, which have been chiefly noticeable at the compensation gauge-house; but fortunately the nuisance is now abating. It is attributed to decayed vegetable matter in the reservoir, the gases generated by which have been liberated from the oxygenation of the water by exposure to the air in the gauge-house and discharge-tunnel. At one time the water of the lake appeared exceedingly impure; a red sediment being formed, which stained the bed of the river. The water was also infested by animalculæ. These, however, have now disappeared; and the water is rapidly becoming restored to its former purity.

THE STROOD WATER-WORKS.—At a meeting of the Rochester Town Council last Tuesday, a discussion took place on the position of the Strood Water-Works. Mr. Wingent, the Chairman of the Water Committee, said a cursory glance at the accounts as printed showed that the year began with a deficit of £636, and ended with a debit balance of £1413, or a loss of £775 on the year's work. This, however, was an entirely misleading idea to accept, for out of the £775 no less than £771 had been spent on a new boiler, and in increasing the water supply by extending the bottom of the well. In addition to this, £110 of principal had been repaid, and £76 expended on new pipes—an expenditure which he took to belong to the capital account, and not to the revenue. The only money paid out of the City of Rochester for the works was £1413. The undertaking was purchased with borrowed money, and not out of the city funds; and as 4 per cent. interest was paid on the loan, he took it as being the same thing as a private company paying 4 per cent. to the shareholders. The Corporation did not want to make the works a profit-earning concern. What was intended was to give the consumers a better supply of water. In the course of the discussion, it was stated that the amount borrowed on the works was £18,019, which has now been reduced to £17,416.

ALLEGED LEAD-POISONING IN THE BRADFORD OUT-DISTRICTS.—At a recent meeting of the Gildersome Local Board, complaints were made as to the quality of the water supplied through the Drighlington Local Board by the Bradford Corporation. It was stated that several cases of lead-poisoning had arisen in the district; and the Clerk was instructed to communicate with the Drighlington Local Board, requesting them to ask the Bradford Corporation to remedy the defect. By instruction of the Bradford Water Committee, the Town Clerk (Mr. T. M'Gowen) addressed a letter to the Clerk of the Gildersome Board, in which he maintained that the water as delivered by the Corporation was absolutely pure, and therefore whatever deleterious consequences arose in its transmission from the Corporation mains to the consumers were due to the improper mode in which it was dealt with during the process of such transit. The matter was brought forward at the meeting of the Drighlington Local Board last Wednesday, when a letter on the subject was read from the Gildersome Board. There was a prolonged discussion, in the course of which two or three of the members stated that the water was unfit for domestic use. The Clerk was requested to write to the Bradford Corporation and inquire if the methods recommended by Professor Thompson, and promised to be put in operation by them, had been carried out.

LEEDS CORPORATION WATER-WORKS.—At a meeting of the Water Committee of the Leeds Town Council last Friday, the Borough Engineer (Mr. T. Hewson) reported that the 13-inch pipe-line from Arthington to Eccup is complete, and is being charged with water to test it. On Monday next the water supply will be complete up to a capacity of 18 million gallons a day, delivered into the Weetwood filter-beds. There is now 69 days' supply in store, as compared with 182 days' supply at the same period of last year. The difference is accounted for by the fact that the Eccup reservoir is now practically out of use. The deficiency, however, is more than compensated for by the increased capacity of the means of supply brought about by the laying of the additional 13-inch main referred to. The Blackmoor tunnel works are proceeding satisfactorily towards completion. Nearly 1200 yards of the tunnelling have been finished. Only another section remains to be completed. With regard to the leakage at the Eccup reservoir, it was reported that the delivery of the pipes necessary for carrying the Washburn Valley water round the reservoir, instead of through it to the Blackmoor tunnel, would begin on Monday. Within a few weeks the pipes are expected to be laid; and the Eccup reservoir will then be entirely thrown out of use. The work of deepening the puddle wall of the embankment, to try, if possible, to abate the leakage, in accordance with the report of the Borough Engineer and of Mr. Hill, of Manchester, will then be proceeded with immediately.

THE SALFORD GAS SCANDAL.—A memorial is being circulated for signature in Salford asking the Government to appoint a Royal Commission to investigate the affairs of the Salford Gas Committee. Sheets have been deposited for signature at about 250 places in the borough, and last Saturday an open-air meeting was held in Salford in support of the object. The petition, it is expected, will shortly be placed in the hands of Mr. H. H. Howarth, M.P., for presentation to the Home Secretary. The document states that for the past 20 years public charges have been frequently made against officials of the Salford Corporation, and have not been inquired into; that in the year —— the Borough Treasurer of the Corporation absconded, being a defaulter to a large amount; that in the year 187– the then Manager of the Corporation gas-works was compelled to resign his appointment under the Corporation; and it was stated that he had accumulated a fortune of £40,000; and that in January, 1887, charges were made against the Gas Committee of the Corporation and against the Manager of the Corporation gas-works (Samuel Hunter). Then follows a brief history of what has occurred since the memorable action which was commenced by the Gas Committee against Mr. Ellis Lever, and continued by Samuel Hunter. It is also mentioned that the Town Clerk (Mr. J. Graves) absconded last year, being a large defaulter to the Corporation; and the petitioners, in conclusion, "humbly pray that your honourable House will order a Royal Commission, armed with all necessary authority and powers, to fully inquire into all matters in connection with these frauds, and other malpractices in connection with the Gas-Works Department of this Corporation."

BURSTING OF A RESERVOIR AT RHODE ISLAND.—The Spring Lake reservoir, near Fiskville (R.I.), in the south-west corner of Cranston, about 15 miles from from the city of Providence, which supplies a whole row of mill villages along the Pawtucket River, burst on the 25th ult. Three persons were drowned, and damage to the amount of $25,000 was done to property. The path of the flood was fortunately through a sparsely-populated district; and the water subsided as rapidly as it came. The *Engineering and Building Record* gives the following particulars of the reservoir:—The dam was built in 1887 for the Pawtucket Valley Company. The reservoir covered 18 acres and contained about 35 million gallons of water. The dam is 925 feet long, 17 ft. 9 in. high, 8 feet wide on the top, and 35 feet wide at the bottom. The embankment is composed of clay and gravel in layers and puddled. The lower slope is retained by a stone wall, and the upper slope is paved with stone. The gap left by the water is between 60 and 70 feet long. It is just above the waste pipe. The cause of the bursting of the dam is believed to be a spring that existed under the middle of the dam. The builders, it is said, did not take sufficient precaution to choke this spring, and it undermined the dam. The reservoir was practically emptied.

THE NOTTINGHAM CORPORATION WATER ACCOUNTS.—Mr. S. P. Derbyshire, one of the Borough Auditors of Nottingham, has just reported upon the accounts of the Water Department of the Corporation. After expressing surprise that the Water Committee presented their report and accounts to the Corporation before they had been examined by the Borough Auditors, he states that the Committee show the revenue for the past financial year to be £928 19s. 2d. more, and the working expenses £488 11s. 11d. more than in the previous year. This statement, without further explanation, is calculated, he says, to mislead the ratepayers, as they would infer that the Water Department had earned a revenue of £440 7s. 3d. more this year than the preceding twelve months. It should, however, be stated that the Committee have this year received from the Estates Committee of the Corporation £989 8s. 8d. for rent (or interest on purchase-money) of the Trent Bridge Works Estate, taken over by the Corporation as on March 25, 1888. Previously this estate produced only £98 17s. per annum; so that as compared with the previous year the Committee on this account alone received an excess revenue of £890 11s. 8d. But for this transaction the Committee would have had to report an increase in revenue of only £38 7s. 6d., and an increase in working expenses of £488 11s. 11d.—in other words, a smaller profit of £450 4s. 5d., notwithstanding that the capital account has during the year been increased by £6715 8s. 2d.

BEIGHTON WATER SUPPLY.—A Local Government Board inquiry was held last Wednesday at Beighton by Colonel W. M. Ducat, R.E., into an application of the Rural Sanitary Authority for the Rotherham Union to borrow £2000 for works of water supply in the township. Mr. Barras, the Clerk to the Authority, said that for a long time they had been asked to supply water to Beighton. At Hackenthorpe a short time ago, there was such a scarcity that numerous complaints were received. So serious was the state of things, that they had made arrangements with the Chesterfield Rural Authority for a supply from their mains. It was also understood that Beighton parish should be supplied when a new service reservoir was made. In connection with the water supply of Hackenthorpe, the Rural Sanitary Authority had spent £700. Mr. Shaw, the Clerk to the Chesterfield Authority, remarked that as soon as the Chesterfield Authority could do so, they were prepared to supply the whole of the parish of Beighton. In the course of further evidence, it was pointed out that, at a public meeting on the previous evening, the feeling was in favour of Beighton being furnished with water from Chesterfield. The water was offered to the Rotherham Authority at 6d. per 1000 gallons, if they would provide the storeage; the cost to be 9d. if Chesterfield did so. Rotherham had chosen the latter. The Inspector said there did not appear to him to be any agreement between the Rotherham and Chesterfield Authorities as to the supply for Beighton; and until he had such an agreement before him, similar to that in force in respect to Hackenthorpe, he was afraid he could not advise the Local Government Board to sanction the loan. As for the £700 that had already been spent, the pipes were filled with water; but if they were to lay pipes down to Beighton, he had no assurance that the water would be put into them. He would withhold his report until the receipt of the agreement.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For STOCK MARKET INTELLIGENCE, see *ante*, p. 544.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
500,000	10	11 Apr.	10½	Alliance & Dublin 10 p. c.	10	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p. c.	10	13—14	..	5 7 2
800,000	100	1 July	5	Australian (Sydney) 5% Deb.	100	109—111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	26—28	..	7 2 10
200,000	5	15 May	7½	Bombay, Limited	5	7¾—7¾	..	4 16 8
40,000	5	,,	7½	Do. New	4	5—5½	..	5 9 4
280,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	238—238	..	5 5 2
125,000	,,	,,	9½	Do. New	100	163—167	..	5 10 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	42—44*	..	5 0 0
320,000	20	28 Mar.	11½	British	20	46—48	+1	4 18 9
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	19—21*	..	5 4 9
39,000	10	,,	8	Do. 7 p. c.	10	13—14*	..	5 14 3
328,750	10	30 May	10	Buenos Ayres (New) Limited	10	14—15	−½	6 13 4
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	105—109	..	5 10 6
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	11 Apr.	13½	Commercial, Old Stock	100	269—274	..	5 0 8
130,000	,,	,,	10½	Do. New do.	100	x13—218	..	4 18 0
130,000	,,	28 June	4½	Do. 4½ p. c. Deb. do.	100	122—125	..	3 12 4
557,320	20	14 June	13	Continental Union, Limited	20	47—49	..	5 6 2
242,680	20	,,	13	Do. New '69 & '72	14	33—34	..	5 6 7
200,000	20	,,	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	28 Mar.	10	Crystal Palace District	100	204—208	..	4 16 2
234,060	10	26 July	13	European, Limited	10	24½—25½	..	5 1 11
120,000	10	,,	13	Do. New.	7½	17½—18½	..	5 5 3
354,060	10	,,	13	Do. do.	5	12—12½	..	5 3 9
5,470,040	Stck.	14 Aug.	13½	Gaslight & Coke, A, Ordinary	100	261—265	+1	5 3 9
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	255—260	+1	3 16 11
80,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	165—171	..	4 1 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	253—258	..	3 17 6
1,061,150	,,	14 June	4	Do. 4 p. c. Deb. Stk.	100	121—124	..	3 4 6
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	127—131	..	3 8 8
650,000	,,	,,	6	Do. 6 p. c. do.	100	171—175	..	3 8 6
3,600,000	Stck.	15 May	10	Imperial Continental	100	211—215	+1	4 13 0
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Apr.	5	Met. of Melbourne, 5 p.c. Deb.	100	115—117	..	4 5 6
541,920	20	14 June	6	Monte Video, Limited	20	21—22	..	5 9 1
150,000	5	30 May	10	Oriental, Limited	5	9—9½	..	5 5 8
60,000	5	28 Mar.	7	Ottoman, Limited	5	6¼—6¾	..	5 8 5
166,870	10	26 July	4	Pará, Limited	10	4½—5½	..	7 5 3
				People's Gas of Chicago—				
420,000	100	2 May	6	1st Mtg. Bds.	100	103—107	..	5 12 1
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
100,000	10	26 Apr	10	San Paulo, Limited	10	16—18	..	5 11 1
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	312—317	+1	5 2 6
1,350,000	,,	,,	12½	Do. B do.	100	237—242	..	5 0 2
141,500	,,	,,	13½	Do. C do.	100	250—260	..	5 1 11
600,000	,,	28 June	5	Do. 5 p. c. Deb. Stk.	100	139—143	..	3 9 11
60,000	5	12 Sept.	11½	Tottenham & Edm'ntn, Orig.	5	11—13*	..	4 8 5
						*Ex div.		
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	273—278	..	3 8 4
1,720,560	Stck.	11 Apr.	7½	East London, Ordinary	100	214—219	..	3 8 6
544,440	,,	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 1 7
700,000	50	14 June	9	Grand Junction	50	127—132	..	3 8 2
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	261—266	..	3 7 8
406,200	100	,,	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	28 Mar.	4	Do. 4 p. c. Deb. Stk.	100	120—123	..	3 5 0
500,000	100	14 Aug.	12½	New River, New Shares	100	360—365	..	3 6 5
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	180—185	..	5 4 10
1,126,500	100	,,	6	Do. 7½ p. c. do.	100	168—173	..	5 9 4
155,066	Stck.	14 June	10	West Middlesex	100	267—272	..	3 13 6

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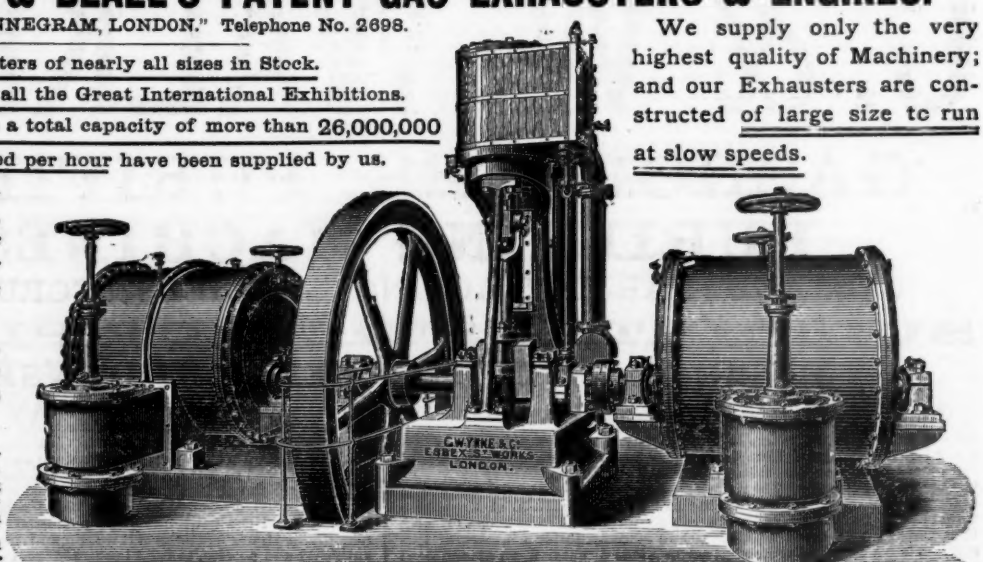

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Applications to be made at once, stating Age, Wages, and Experience, to Mr. Dickinson, Gas and Water Manager, Hindley.

By order,
STEPHEN HOLT, Clerk.

Hindley, Sept. 13, 1889.

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Applications (with testimonials) to be sent to Mr. Thos. Eaton, Secretary of the Gas Company, Thrapstone, on or before Friday, Sept 20.

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TENDERS wanted for a 6-inch Pipe Con- DENSER; SCRUBBER, 9 feet high by 3 feet diameter; IRON RETORT-HOUSE ROOF; HYDRAULIC MAIN; and RETORT-FITTINGS.

Plans and specifications may be seen at the Offices of Mr. Henry Dennis, Ruabon, to whom tenders must be sent on or before the 1st of October.

TIMMIS & CO., of STOURBRIDGE Make only the best quality of FIRE-CLAY RETORTS, BRICKS, TILES, & LUMPS. Also SPECIAL SILICA BRICKS, to stand great heats. All descriptions kept in Stock.

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*** See Advertisement p. 579 of this week's issue.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

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FOR SALE, cheap—One Gasholder and TANK, 12 feet square. Also one COMPRESSING PUMP, with 4-inch Delta Metal Ram. Will compress to 20 cwt. per square inch. About twenty 80-feet STEEL GAS-TUBES, tested to 1½ tons. All in use about three Months only.

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IN pursuance of the Crays Gas Order, 1884, notice is hereby given that it is the intention of the Directors of this Company to SELL BY TENDER 200 SHARES of the Nominal Value of £10 each.

Forms of Tender and further particulars may be obtained on application at the Offices of the Company.

Sealed tenders must be sent to the undersigned not later that Five o'clock in the afternoon, on Tuesday, the 1st day of October, 1889.

By order,
FRANCIS M. EDWARDS,
Secretary and Manager.

Offices: The Gas-Works, St. Mary Cray, Kent, Sept. 11, 1889.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. Spent Oxide and Sulphate of Ammonia purchased. 120 and 121, NEWGATE STREET, LONDON, E.C.

TUBES.

FOR Gas, Steam, and Water; Galvanized, White Enamelled, and Hydraulic Tubes and Co.

JOHN SPENCER, Globe Tube Works, WEDNESBURY, and 14, Great St. Thomas Apostle, LONDON.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID for making SULPHATE OF AMMONIA of high quality and colour. *Delivery in Railway Tank-Wagons or Carboys.*

Highest References and all particulars supplied on application.

HUTCHINSON BROTHERS, Barnsley, Gas Engineers and Contractors, Makers of Gas-Meters and General Gas Apparatus, Sulphate of Ammonia Plant, Tools, and Sundries.

*** See large Advertisement in last week's issue, page 525.

SULPHURIC ACID, B.O.V., for Sulphate of Ammonia Making. Guaranteed clear, of full strength, and to produce a fine white-coloured salt, Delivered in carboys or railway tank waggons.

For prices and terms address BALE, BAKER, AND Co., 120 & 121, Newgate Street LONDON.

To Furnishing Ironmongers, Shippers, Stores, Furnishing Houses, Gas Companies, Gas and Electric Fitters and Fitting Manufacturers, Artistic Workers in Wrought Iron and Brass, Billiard Light and Lamp Manufacturers, Architects, Builders, and Others.—Important absolute Sale of the extensive first-class, highly-finished London Stock of Winfields, Limited, at No. 47, Holborn Viaduct, London, E.C.

MR. SCAMELL has instructions to Sell by Auction, on the Premises, as above, on Monday, Sept. 16, and Following Days, commencing each day at One precisely, the above STOCK, comprising a large and varied assortment of CHANDELIERS, GASALIERS, ELECTROLIERS, Brackets, Pendants, Hall Lanterns, Billiard Lights, Arc Lamps, handsome and massive Gasaliers and Floor Lights for Public and Ecclesiastic Buildings, in Wrought Iron and Brass, in Original and Elegant Designs, fitted for Candles, Oil, Gas, and Electric Lighting; Artistic Wrought-Iron and Brass Lamp and Flower Stands, suitable for the Table, Hall, Library, Dining and Drawing Room; Marble-top Dressing-Tables, fitted with Handsome Frame Toilet Glasses; Fire-Screens, Banner Arms, and Bannerets; Handsome Wall Plaques, with Mirrors and Elegant Porcelain Vases; large and varied assortment of Winfield's Patent Spring Curtain Chains in Brass and Copper; Cornice Ends; Rings and Brackets; Cased and Solid Stair-Rods, Picture Rods, Ends, and Brackets; Fancy and Plain Lacquered Brass Tubing and Strips, French Pulley Rods, Brass Fenders, Fire, Brasses and Dogs; Sugg's Enamelled Gas-Cooking Stove; quantity of elegant Globes, Fixtures, Fittings, and useful Sundries in Galleries and Workshops.

May be viewed on and after Monday, Sept. 9, and Catalogues had (6d. each) on the premises, and of Mr. Scamell, 40 and 41, Upper Thames Street, London, E.C.

The Directors of Winfields, Limited, beg to state that they intend for the future to keep a complete Set of the newest Patterns of their Manufactures at their Office and Sample Room, No. 49, Farringdon Street, London, E.C. These will be for the inspection of the Trade, or of those introduced by them only. All orders will have prompt attention, and be sent direct from their Works at Birmingham.

C. & W. WALKER.

GASHOLDERS; PURIFIERS; PURIFYING MACHINES;

CO$_2$ AND TAR-EXTRACTING WASHERS; SCRUBBERS;

SULPHATE & SULPHUR PLANT;

RETORT MOUTHPIECES; CONDENSERS;

LIFTING APPARATUS; CENTRE AND FOUR-WAY VALVES;

SLIDE VALVES; TAR BURNERS; &C., &C.

WOOD SIEVES.

ADDRESSES:

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"FORTRESS LONDON." "FORTRESS DONNINGTON."—Telegraphic.

FOR SALE—Single Gasholder, 60 feet diameter by 28 feet deep. Capacity, 65,000 cubic feet; fixed complete; in good condition.

Also four PURIFIERS in a line, 14 ft. square by 4 ft. deep, with Centre-Valve and Connections, Wrought-Iron Covers, Lifting Gear, and Crab complete. Makers, Messrs. C. & W. Walker.

Also four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep; 12-inch Centre-Valve and Connections.

Would erect the above and make practically equal to new.

Inquiries invited for various second-hand Gas Plant—Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.

Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

GASHOLDER FOR SALE.

GASHOLDER for Sale in good working order; not a fault in it. Size, 80 ft. by 20 ft., with Cast-Iron Pillars and Wrought-Iron Girders.

Further particulars may be obtained from, and offer for it may be sent to the undersigned.

JOHN CHEW, Gas Engineer.
Corporation Gas-Works, Blackpool,
Sept. 6, 1889.

TO RETORT MAKERS.

THE Gas Committee of the Corporation of Blackpool are prepared to receive TENDERS for the RETORTS and FIRE GOODS required during the next Twelve months.

Specification and form of tender may be had on application to the undersigned.

Tenders, endorsed outside, and addressed to the Chairman of the Gas Committee, must be sent in by the 21st of September.

By order,
JOHN CHEW, Gas Engineer.
Corporation Gas-Works, Blackpool,
Sept. 6, 1889.

THE Directors of the Winchcombe Gas-light and Coke Company, Limited, invite TENDERS for the Construction and Erection of a new GASHOLDER, 35 feet by 12 feet, with five Columns, Balance-Weights, &c., complete.

The accepted Tenderer will be expected to furnish plans (or tracings), with specification of a suitable Brick-Tank for above.

Tenders, to be sent in to the undersigned not later than the morning of the 23rd of September, 1889.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
W. G. OWEN, Secretary and Manager.
Gas Office, Winchcombe, Gloucestershire,
Sept. 11, 1889.

TENDERS FOR TAR.

THE Derby Gaslight and Coke Company are prepared to receive TENDERS for the purchase of the surplus TAR they will have for disposal during the Twelve months ending Sept. 30, 1890—namely, about 1800 tons, to be divided into Three Contracts of 600 tons each.

The Company will probably dispose of the total Surplus of Tar (approximately 1800 tons) in One, Two, or Three Contracts, as the Board may decide; but they do not bind themselves to accept the highest or other tender or tenders.

Tenders must be addressed to the Chairman of the Finance Committee of the Derby Gaslight and Coke Company, Friar Gate, Derby, endorsed, "Tender for Tar," and delivered on or before Wednesday, the 25th day of September, 1889.

Further particulars may be had on application.

By order,
RICHARD FISHER, Secretary.
Derby Gas Office, Sept. 9, 1889.

TO TAR DISTILLERS AND MANUFACTURING CHEMISTS.

THE Windsor Royal Gaslight Company are prepared to receive TENDERS for the purchase of their surplus COAL TAR and AMMONIACAL LIQUOR (10-oz. Liquor) for One year, from Sept. 30, 1889.

The Tar will have to be removed in barrels; but the Liquor can be pumped into Railway Tanks on the Great Western Railway.

The Contractor must be prepared to keep the Company cleared of both Tar and Liquor, and to provide all the necessary barrels for the purpose.

The Directors do not bind themselves to accept the highest or any tender.

Any further information may be obtained on application to Mr. James Wadeson, Manager.

Sealed tenders, stating price at the Company's Works, free of all charges, must be sent in by Twelve o'clock at Noon, on Friday, the 27th day of September, 1889,

By order,
GEO. CARTLAND, Secretary.
Gas Offices, Victoria Street, Windsor.

COMMERCIAL GAS COMPANY.

NOTICE is hereby given that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Friday, the 4th of October, 1889, at Twelve o'clock at Noon, to receive the Report of the Directors, to declare a Dividend, and for other Business.

The Stock Transfer Books will be closed from the 21st of September inst. to the 4th of October next, both days inclusive.

By order of the Board,
H. D. ELLIS, Secretary.
Offices, Stepney, Sept. 12, 1889.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is hereby given that the Half-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office, on Wednesday, the 25th inst., at half-past Twelve o'clock precisely, to transact the usual Business, to declare a Dividend for the Half Year ended the 30th of June last, and to elect two Directors and one Auditor in the place of those who go out by rotation, but who are eligible to be re-elected.

Notice is hereby also given that the Transfer Books of the Company will be closed on the 14th, and re-opened on the 26th inst.

By order of the Court of Directors,
FREDERIC LANE LINGING,
Secretary.
Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
Sept. 4, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

GEO. E. TOURNAY,
Retort-Setter,
Contractor for the Erection of Retort-Ovens, Chimney Shafts, &c.,
THANNINGTON, CANTERBURY.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

COZE'S
AUTOMATIC SYSTEM
OF
Charging and Drawing Retorts.

THIS System of automatically Charging and Discharging Retorts without machinery or arduous labour, which is in operation at several places, will shortly be at work in England.

All information as to the advantages, cost, &c., of the System, can be obtained from the undersigned, who will arrange to grant the user for a small Payment per Retort, or a slight Royalty. The System is fully patented; and any infringer will be strictly proceeded against.

An Agent will shortly be appointed in England.

A. COZE,
MANAGER, RHEIMS GAS COMPANY, FRANCE.

MARQUIS OF LOTHIAN'S
NEWBATTLE CANNEL.
QUOTATIONS ON APPLICATION TO
MR. JOHN MORISON,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

Now Ready, Fcap. 4to, Cloth, Gilt Lettered, with numerous Illustrations, price 7s. 6d., post free.

PRACTICAL PHOTOMETRY:

A GUIDE TO THE STUDY OF THE

Measurement of Light.

By WILLIAM JOSEPH DIBDIN, F.I.C., F.C.S.,

Member of the Society of Public Analysts and of the Committee of the London Section of the Society of Chemical Industry.

CHEMIST AND SUPERINTENDING GAS EXAMINER TO THE LONDON COUNTY COUNCIL.

The aim of the Author has been to give a comprehensive account of the various methods of Photometry in daily use, and to make the book thoroughly practical by indicating the many precautions necessary for ensuring accurate results in photometrical work. The volume contains chapters on the History and Principles of Photometry; Horizontal, Radial, and Jet Photometers; Standards of Light; the Proposed Substitute for Candles; the Auxiliary Apparatus required in Testing Gas; the Examination and Adjustment of a Gas-Testing Photometer; and Colour and Stellar Photometry; together with an Appendix comprising the Notification of the Metropolitan Gas Referees, Tables for the Correction of Volume of Gas and Observations of Candles, and other matter useful to Photometrists.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

GEORGE McKAIG,
MANUFACTURER OF **WOOD GRIDS** FOR GAS PURIFIERS,
36, Cleveland Street, DONCASTER.

COKE BREAKERS,
FROM £14 EACH.
(THOMAS & SOMERVILLE'S PATENT.)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.
GEORGE WALLER & CO.,
PARK STREET, SOUTHWARK, S.E.

THE ONLY RELIABLE
DRY CENTRE-VALVE.
WORKING ONE, TWO, THREE, OR FOUR PURIFIERS ON AT THE TIME.
ALSO MADE FOR TWO OR THREE PURIFIERS.
No Springing. No Leakage. No Foul Gas passed in Changing. Special Facility for Blowing the Air out of the Fresh Box before putting in Action, without driving it forward into the Holders.
Write for Prospectus.
ALSO DOUBLE-ACTION DOUBLE-FACED GAS & WATER VALVES.
F. WECK, 86, NEW STREET, BIRMINGHAM.

Newland Gas Coal
For particulars, apply to
LOCKE & CO.,
NORMANTON,
YORKSHIRE.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

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Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
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TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY,
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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FOR GAS AND WATER.
VALVES
FOR GAS, WATER, AND STEAM.
TELEGRAMS E. "PIPES GLASGOW."
WM. MACLEOD & CO.,
56, ROBERTSON STREET, GLASGOW.

GAS COAL.
POPE & PEARSON, LTD.,
have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.
One ton yields 12½ cwt. of good coke.
This Coal can be shipped from Hull, Goole Liverpool, Morecambe, and Barrow.
For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

THE
"SILVER" LICHT.

CHANDLER'S PATENT.
SUITABLE FOR EVERY FORM OF LIGHTING.
A beautiful white light from ordinary Gas. Silent, steady, and economical.
PACKED IN BOX 9s., SUBJECT.
S. CHANDLER & SONS,
Central Works, Kennington Oval, S.E.

To effect a great saving in
GAS-FURNACES use our
Special Derbyshire GANNISTER BRICKS.
ADDRESS
JAMES WHITE & Co.,
ALBERT WORKS, WIDNES.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

GAS AND WATER PIPES.
1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.
ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.
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Telegrams:
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"SPRINGBANK, GLASGOW."

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for
CANNEL & COAL.

TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·83 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to
YOUNG, DANCE, & CO.,
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

RUSCOE'S PATENT MACHINE
FOR DRILLING AND TAPPING WATER-MAINS AND GAS-MAINS UNDER PRESSURE.
Patent Saddle Back and Drilling Apparatus, whereby Gas and Water Mains can have 2-in., 3-in., 4-in., 5-in., and 6-in. Branches put on without loss of Water or Gas.
Sole Maker of HELPS' PATENT PIPE EXTRACTOR.
Prices and Particulars on Application to
JOHN RUSCOE, Albion Works, Hyde, near Manchester.

W. H. SPENCER & CO., HITCHIN,

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CAST-IRON SYPHON PUMPS.

2½-inch BORE, **6-inch** STROKE,
£1 7s. 6d. each.
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£1 14s. 0d. each.

Every Description of PUMP and VALVE, and WROUGHT and CAST IRON and BRASS DETAILS.

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Limp Cloth; price 2s., free by post.

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OF
Gas Values, Discounts, Dividends, and Weights and Measures,
FOR USE IN GAS OFFICES.

REPRINTED FROM THE SECOND EDITION OF
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SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

THE SCHÜLKE REGENERATIVE LAMP
FOR DOMESTIC AND EXTERNAL LIGHTING
The only Generative Lamp employing the common flat-flame burners.

Lamps giving 20-Candle Power consume less than 4-feet of Gas per hour.

A PURE WHITE AND PERFECTLY STEADY LIGHT NOT AFFECTED BY DRAUGHTS
Suitable for any existing fittings (brackets or suspending). Can be fixed in a few minutes.
May be seen at the Offices of the

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WHERE PRICE LISTS AND FULL PARTICULARS MAY BE OBTAINED.

FUEL OIL - GAS OIL
BLACK LUBRICATING OIL.

THE KEROSENE COMPANY, LIMITED, are the only Importers of RUSSIAN RESIDUUMS in bulk by Tank Steamers, and can supply GAS-WORKS and IRON-WORKS, LUCIGEN and other LIGHTS, COLLIERIES, RAILWAYS, &c.

COMPANY'S STEAMERS:
"KASBEK," "ELBRUZ," "DARIAL," EACH 3700 TONS OIL CAPACITY.

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SPECIALITIES.

THE "NUGENT"
RECUPERATIVE RETORT SETTINGS and FURNACES.

"ROBUS" IMPROVED
RETORT SETTINGS, with COKE, TAR, and BREEZE FURNACES.

THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.

Every Particular, with Estimates, forwarded upon Application to

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CONTRACTORS FOR THE ERECTION OF GAS & WATER WORKS,
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BRECKENRIDGE CANNEL,

OF KENTUCKY, U.S.A.

The undersigned, SOLE AGENTS for this celebrated Gas Cannel, now offer it for delivery at any port in

GREAT BRITAIN,

ON THE CONTINENT,

OR SOUTH AMERICA.

This Cannel ranks with the Australian Shale as an enricher of Coal Gas; One Gross Ton producing

15,000 Cubic Feet of 50-Candle Gas, & 26 Bushels of superior Marketable Coke.

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JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

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THOMAS SPITTLE, LTD.

[ESTABLISHED OVER 50 YEARS.]

CAMBRIAN FOUNDRY, NEWPORT, MON.,

MAKERS OF

CAST-IRON PIPES FOR GAS, WATER, AND STEAM.

ALSO

Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

ALSO ALL WROUGHT-IRON WORK.

THE LARGEST MAKERS IN WALES.

ASHMORE, BENSON, PEASE, & CO., LTD., STOCKTON-ON-TEES.

ENGINEERS & CONTRACTORS
Manufacturers of GAS APPARATUS & PLANT GAS WORKS
Designed & Constructed ABROAD AND HOME
ASHMORE BENSON PEASE
STOCKTON-ON-TEES & DARLINGTON
MAKERS OF LARGEST GAS HOLDER IN THE WORLD
GASHOLDERS, TANKS, SCRUBBERS
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SEE CATALOGUE
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STEEL COAL SCOOPS A SPECIALITY
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TO GAS MANAGERS. SULPHATE OF AMMONIA PLANT.

CLIFF JOHN, & SONS, 7, WELLINGTON ST., LEEDS. FIRE-BRICKS & RETORTS.

Telegrams—"Fire-Brick, Leeds." Works: "Cliff, Potteries, Runcorn."

N.B. This Firm will quote on application their Discount Price of all Fire-Clay Goods. "Leeds" and "Yorkshire" qualities.

CHEMICAL STONEWARE "The best" for resisting Acids.

TAPS SEND FOR PRICE LIST.

"LIGHT, **Wenham Gas Lamps** MORE LIGHT."

ITS ADVANTAGES ARE:

IMMENSE ECONOMY IN THE CONSUMPTION OF GAS.

INTENSITY, PURITY, AND STEADINESS OF THE LIGHT.

Absence of Downward Shadow. Practical Completeness of Combustion.

CAN BE FITTED TO ORDINARY SUPPLY-PIPES WITHOUT ALTERATION.

CAN BE USED AS VENTILATING LIGHTS, whereby the products are removed, and damage to decorations, &c., prevented.

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PATENT WATER-VALVES

NO DETERIORATION THROUGH AGE AND FREQUENT USE.
LEAKY AND STICKING SLIDES ENTIRELY AVOIDED.
LEAKAGE IMPOSSIBLE. EASILY MANIPULATED. NEAT AND COMPACT

UNSOLICITED TESTIMONIAL FROM ST. HELENS.

Corporation Gas-Works, St. Helens,
Aug. 2, 1889.

Samuel Cutler and Sons,
Millwall, London, E,

Gentlemen,—We have now had your Water Seal Centre-Valves at work in our New Purifying-House since last year, and have found them to do all you said they would; and we are more than satisfied with them.

I had previously worked the Dry-Faced Valve and the ordinary Hydraulic Valves, and am quite satisfied that we shall be saved the many anxieties caused by the various faults of these other makes of Centre-Valves.

I shall be pleased to let anyone see them in operation upon application here.—Yours faithfully,

(Signed) Samuel Glover.

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LONDON, BIRMINGHAM, NOTTINGHAM, MANCHESTER (THREE STATIONS), FOLKESTONE, YARMOUTH, MAIDSTONE, IPSWICH, NORWICH, SOUTHPORT, ST. HELENS, &c., &c., and give great satisfaction.

Estimates and Drawings submitted on Application.

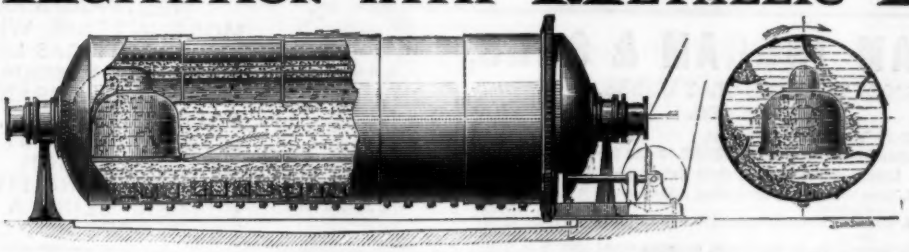
S. CUTLER & SONS, MILLWALL, LONDON, E.

THE REVOLVING PURIFIER

(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY.

REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

GOLD MEDAL, INVENTIONS EXHIBITION, 1885.

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R. DEMPSTER & SONS, Ltd.,

ESTABLISHED 1855.

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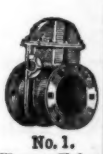


No. 1. Flange Valve.

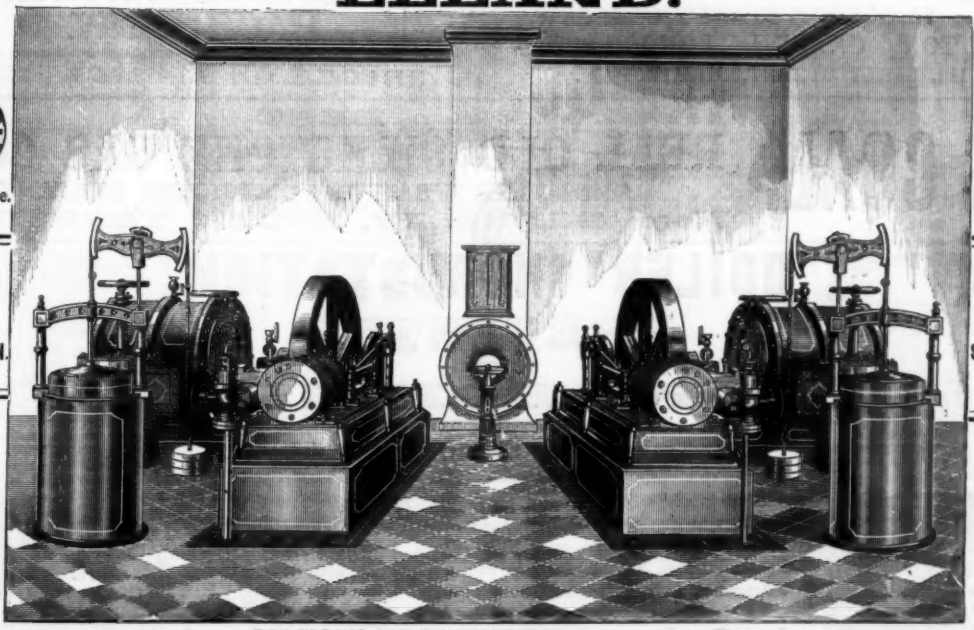
No. 5. Screw Valve.

NO SLIP.

NO OSCILLATION.

NO HIGH SPEED.

STEADY GAUGE.



No. 3. Screw Valve.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

Testimonials and References on Application to

DEMPSTERS', ELLAND.

JOHN HALL & CO.,

STOURBRIDGE

MANUFACTURERS OF FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

A STOCK OF DIFFERENT SHAPES ON HAND.

WILLIAM INGHAM & SONS,

WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing Adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT

MACHINE-MADE GAS-RETORTS.

THE "LUCIENT"
HIGH-POWER & DURABLE GAS-LAMP.

ALEXANDER BROWN'S PATENT.

Gives the most intense, brilliant, and steady white light yet produced from gas. A light of over 270 candles for 13 cubic feet per hour. Such results are unapproached by any other Regenerative Gas-Lamp. To be seen in operation, and full particulars obtained of

ALEXANDER BROWN & CO.,
24, GORDON STREET, GLASGOW,
90, HATTON GARDEN, LONDON, E.C.,
And 113, EMILY STREET, BIRMINGHAM.

HORSELEY COMPANY, LTD.

TIPTON, STAFFORDSHIRE.

London Office: 6, Westminster Chambers, Victoria Street.

GAS ENGINEERS, IRONFOUNDERS, &c.,
MANUFACTURERS OF
GASHOLDERS,
AND ALL KINDS OF GAS AND WATER WORKS PLANT.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP,
WESTPHAL'S PATENT.
MOST INTENSE WHITE BRILLIANT GAS LIGHT.
MOST ECONOMICAL, SIMPLE, AND DURABLE.
DOES NOT GET OUT OF ORDER.
RIVALS THE ELECTRIC LIGHT.
NO ALTERATION REQUIRED TO EXISTING FITTINGS.
BURNER, BEING A CIRCULAR SLIT, DOES NOT CHOKE UP.

PARTICULARS & PRICES POST FREE.

HENRY GREENE & SONS,
SOLE CONSIGNEES FOR GT. BRITAIN & COLONIES,
153 TO 155, CANNON STREET,
LONDON BRIDGE, E.C.

TELEGRAPHIC ADDRESS, "GAS LEEDS."

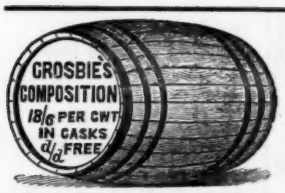
LONDON OFFICE, 60, QUEEN VICTORIA ST. E.C.

CLAYTON SON & Co
LIMITED,
LEEDS,
MAKE
RETORT LIDS
OF ALL FORMS & SHAPES
IN IRON OR STEEL
BY SPECIAL HYDRAULIC MACHINERY.

PRICES ON APPLICATION.

GAS COAL.

BEST
REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
Near BARNSLEY, SOUTH YORKSHIRE.



Messrs. Pease and Partners, Ld., Colliery Proprietors, Darlington, write: "Your Composition has given satisfaction wherever we have used it."

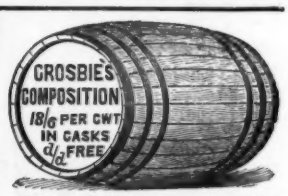
BOILER INCRUSTATION PREVENTED

IN OVER

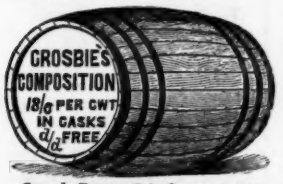
1250 BOILERS

BY THE USE OF

Crosbie's Composition.



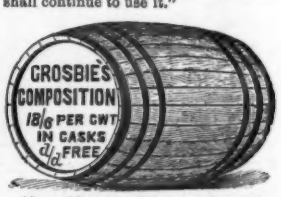
The Pembroke Dock and Town Gas Company write: "Your Boiler Composition is giving satisfaction; and we shall continue to use it."



Sample Drums **20s.** per cwt. d/d.

Scores of Testimonials can be had on application, and references can be given to Engineers, Colliery-Owners, Iron-Works, Cotton-Mills, Paper-Mills, Woollen-Mills, Brewers, Ship-Owners, Gas-Works, Glass-Works, Dyers, Printers, and, in fact, to Steam Users in almost **every Branch of Trade.**

"CROSBIE'S COMPOSITION" is testified by leading Analysts as **absolutely harmless to Metals,** and is certainly the most **economical** means of preventing Incrustation that it is possible to obtain.



Also sold at **2s. 3d.** per gallon d/d

ADOLPHE CROSBIE, Walsall Street Chemical-Works, WOLVERHAMPTON.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

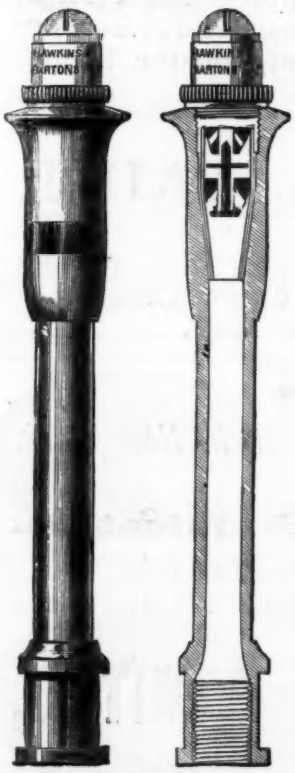
Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

THE GAS APPARATUS Co., PETERBOROUGH,



Full Size, No. 1098.
These Governors are made to take to pieces for cleaning and re-adjusting.

GAS ENGINEERS,

Manufacturers, Gas-Works Furnishers,

AND MAKERS OF ALL KINDS OF

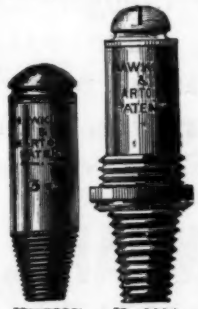
Gas Burners, Governors, Lamps, Gauges,

AND SPECIALTIES OF EVERY DESCRIPTION.

ALSO SOLE MANUFACTURERS OF

Hawkins & Barton's Patent Self-Regulating Lamp Governors and Burners.

An enormous quantity of these Burners are in use in this Country and abroad; and they have never failed to give satisfaction. Wherever they are adopted, complaints against Bad Gas and Excessive Gas Bills naturally cease. Owing to their extreme simplicity, they cost less than half that of any others, and will last years without attention.



No. 1096. No. 1094.

Trial Orders Solicited.

PRICES AND TERMS ON APPLICATION.

REPORTS

By T. NEWBIGGING, Esq., C.E.
Feb. 25, 1889.

Burner tested, 4 feet.
Pressure, 10, 15, 20, 25 tenths.
Consumption, 4, 4, 3·95, 3·8 feet.

By G. BOWER, Esq., C.E.,
St. Neots, *March* 12, 1889.

"I have tested your Pressure Regulating Burners; and I find that those you sent me do not vary more than two-tenths under pressures varying from six to forty tenths. I shall not only use them myself, but I shall recommend others to use them."

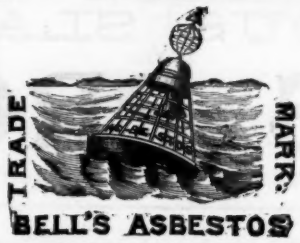
By J. MACKAY, Esq., Engineer,
Gas-Works, Peterhead,
July 13, 1889.

"The enclosed Burner has been in use here all last winter, and does not seem much the worse. We had seven different kinds of Governors on trial and yours seemed to come out the best. Please send us five gross more of the same kind."

Works & Offices: PETERBOROUGH.

Awarded FIRST PRIZE MEDAL at the Falmouth Royal Polytechnic Exhibition, 1889.

BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

BELL'S ASBESTOS COMPANY, LIMITED,

SOUTHWARK, LONDON, S.E.

DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street. CARDIFF: West Bute Street. BIRMINGHAM: 7, John Bright Street. HULL: Humber Dock Basin. GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN and BARCELONA.

BELL'S ASBESTOS DAGGER PACKING

PATENT No. 15,498.

ROUND.

SQUARE. Every 10 feet has Label as above, and bears our Trade Mark.

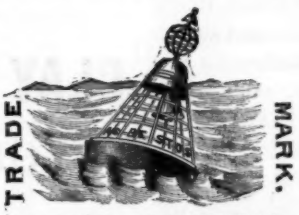
Under this registered title are included the inventions of Mr. Field; and experience has proved them to be the MOST EFFICIENT DURABLE, and ECONOMICAL PACKINGS ever made. They constitute such a combination of Asbestos and India-rubber as secures the maximum of elasticity and heat resistance; and they are, therefore, UNEQUALLED FOR EVERY KIND OF ENGINE. These Packings are being universally used by most of the leading Steamship Companies throughout the world for ordinary Compound, Triple, and Quadruple Expansion Engines of the latest types. The packings are composed of rolled Asbestos Cloth, but the India-rubber is placed in two forms to suit various cases.

IN ORDERING STATE WHETHER SQUARE OR ROUND IS REQUIRED.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.

MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
DUBLIN, BERLIN.



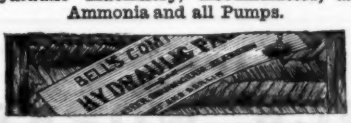
DEPÔTS.

BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
CARDIFF: West Bute Street.
And BARCELONA.

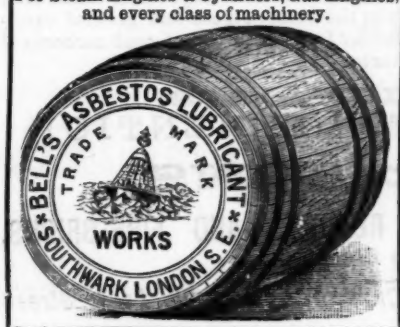
SOUTHWARK, LONDON, S.E.

BELL'S ASBESTOS
YARN AND SOAPSTONE PACKING
Is the BEST LOCOMOTIVE PACKING made.

BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for
Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.



BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



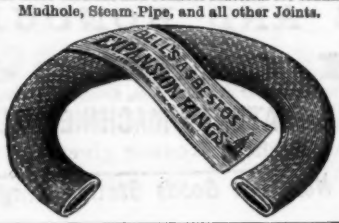
BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

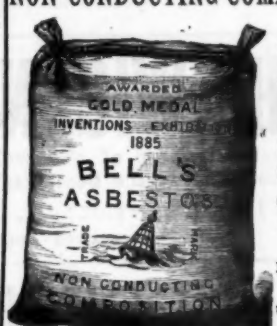
ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL.

Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
EXPANSION SHEETING
RINGS, AND TAPE.
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.



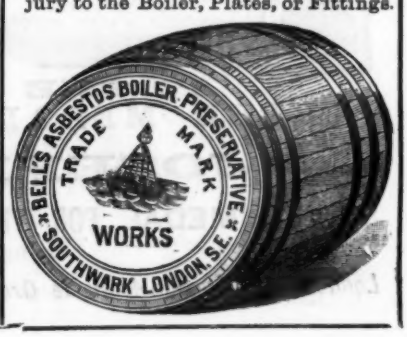
ALL BAGS ARE MARKED AS ABOVE.

Will reduce loss by radiation, and saves 40 per cent. of fuel.

Is suitable for boilers with flat or round bottoms. Is superior to any other, and saves its cost in a few months.

Is sent out dry in bags; therefore cheaper than others sent out wet.

BELL'S ASBESTOS
BOILER PRESERVATIVE
Will effectually keep Boilers clean, and remove any Incrustation, without injury to the Boiler, Plates, or Fittings.



CLAYTON, SON, & CO.

ESTABLISHED A QUARTER OF A CENTURY. LIMITED.

MANUFACTURERS OF ALL KINDS OF

GASHOLDERS

AND

GAS PLANT

OF EVERY DESCRIPTION.

LONDON OFFICE: 60, QUEEN VICTORIA STREET, E.C.

HUNSLET, LEEDS.

J. & W. HORTON

ETNA WORKS,

SMETHWICK,

NEAR BIRMINGHAM

(Established 50 Years),

PATENTEES

AND

MANUFACTURERS

OF

IMPROVED GASHOLDERS AND BOILERS

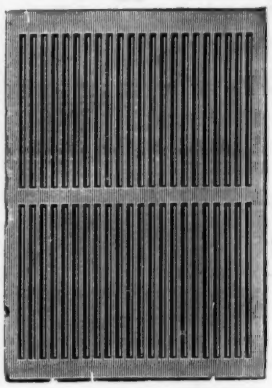
and Manufacturers of every description of

Gas Apparatus

Cast and Wrought Iron Tanks, Purifiers, Condensers, Scrubbers, Retort-Lids, Cross-Bars and Screws, Wrought-Iron Boilers for Stationary, Portable, and Marine Engines, Sugar Pans, Coolers, Clarifiers, Punts, Boats, Bridges, Girders, Roofs, Cisterns, Oil-Tanks, Melting-Pots, Crucibles, Salt-Pans, Arch and Range Boilers, and every description of General Ironwork.

Drawings, Specifications, and Estimates supplied.

R. & J. DEMPSTER'S



WOOD GRIDS FOR PURIFIERS

Made from any kind of Timber, of any Size or Shape, by trained Workmen and specially-designed Machinery.

Quick delivery and accuracy guaranteed.

BOARDS FOR SCRUBBERS

Cut and fitted upon the most successful system.

GRIDS FOR SULPHATE PLANTS.

Prices moderate. Inquiries solicited. Estimates free.

LONDON OFFICES:

181 & 182, Gresham House, Old Broad Street, E.C.

GAS PLANT WORKS,

NEWTON HEATH, MANCHESTER.

GAS AND WATER PIPES

AND

CASTINGS OF EVERY DESCRIPTION.

MANUFACTURED BY THE

CLAY CROSS COMPANY.

CHESTERFIELD.

TRADE	TELEGRAMS:	LONDON AGENTS:
MARK.	"JACKSON," CLAY CROSS.	BECK & Co., 53, QUEEN VICTORIA ST., E.C.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE STREET, BIRMINGHAM—AGENT: A. C. SCRIVENER.

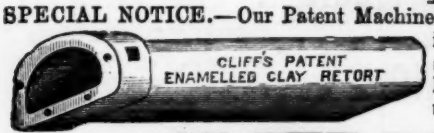
TELEGRAPHIC ADDRESS "WIGAN BIRMINGHAM." TELEPHONE No. 200.

JOSEPH CLIFF AND SONS,

THE ORIGINAL (ESTABLISHED 1795). **WORTLEY FIRE-BRICK WORKS,**

NEAR LEEDS.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.



AT THE PARIS EXHIBITION, 1878,

THREE MEDALS AND HONOURABLE MENTION

WERE AWARDED TO

JOSEPH CLIFF & SONS,

For their Various Exhibits, amongst which is a

SILVER MEDAL FOR THEIR PATENT MACHINE-MADE RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this Class.

London Wharf: No. 4, Inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

CARSON'S PAINT

FOR

GASOMETERS and all OUTBUILDINGS

IN THE

VICINITY OF GAS-WORKS,

MIXED READY FOR USE.

This PAINT is not affected by Sulphuretted Hydrogen, Damp or Impure Air, and is specially recommended to

GAS COMPANIES.

Patterns and full Particulars Post Free. Quotations for Quantities.

THE "LA BELLE" ENAMEL,

Specially prepared for Engine-Beds and Machinery of every description. Stands the action of Mineral Oils, Heat, Gases, &c. Dries hard with a glass-like surface.

WALTER CARSON & SONS,

LA BELLE SAUVAGE YARD, LUDGATE HILL, LONDON;

And BACHELOR'S WALK, DUBLIN.

SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES APPLY TO THE

Sole Agents and Manufacturers,

GODDARD, MASSEY, & WARNER, ENGINEERS,

NOTTINGHAM,

OR TO

MAURICE SCHWAB,

96, DEANSGATE, MANCHESTER.

The Apparatus has been supplied to the following Firms—

BURT, BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (4 Apparatus).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited, SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations:—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'.	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
DENTON.	SOWERBY BRIDGE.	LEEK.
ST. ALBANS.	LEICESTER.	IPSWICH.
DUKINFIELD.	DARWEN.	BOURNEMOUTH.
NORTHWICH.	NELSON.	SALFORD.
HUDDERSFIELD.	ORMSKIRK.	LUTON.
		HAMPTON COURT.

W. C. HOLMES & CO.,

CONTRACTING GAS ENGINEERS.

SPECIALITIES.

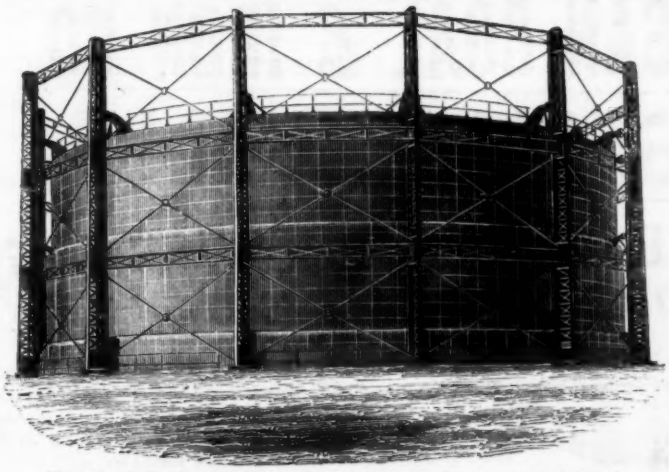
Patent Regenerative Retort-Settings.

Patent Rotary Scrubber-Washer.

Patent Reciprocating Exhauster.

Patent Regulator.

Patent Anti-Dip Pipes.



Treble-Lift Gasholder, 130 ft. by 60 ft., as erected at Burton-on-Trent.

SOLE MAKERS OF

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GAS PLANT

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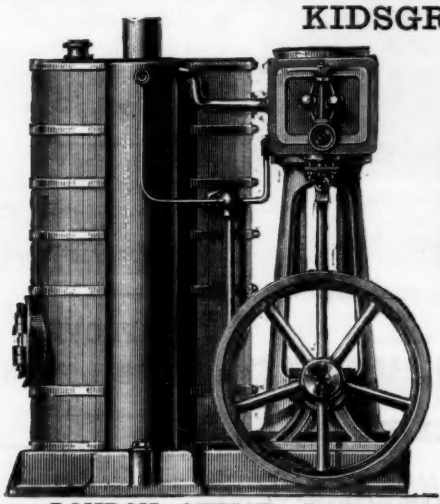

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